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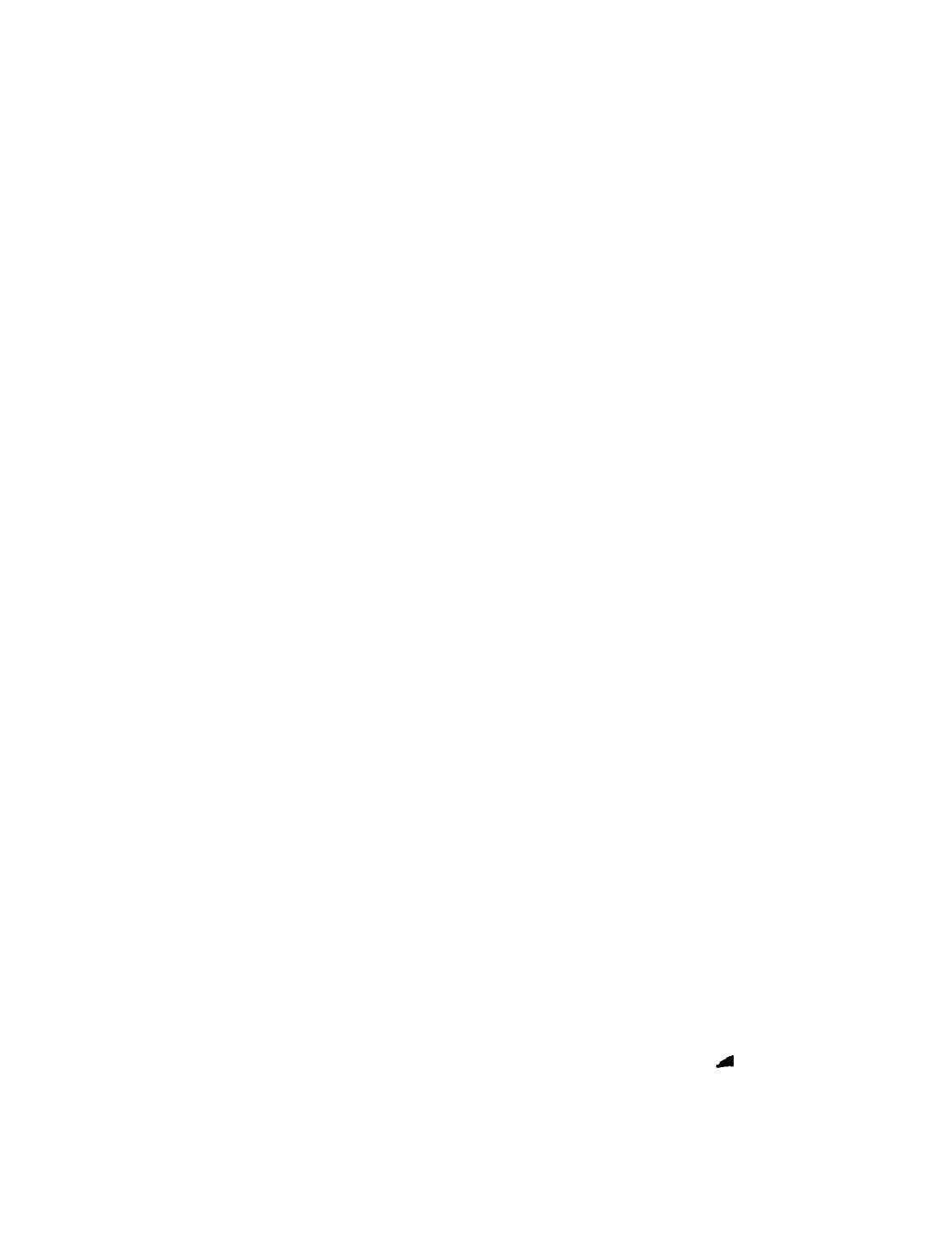
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# AY-FEVER PREVENTION AND CURE

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W.C. HOLLOWETER M.D.





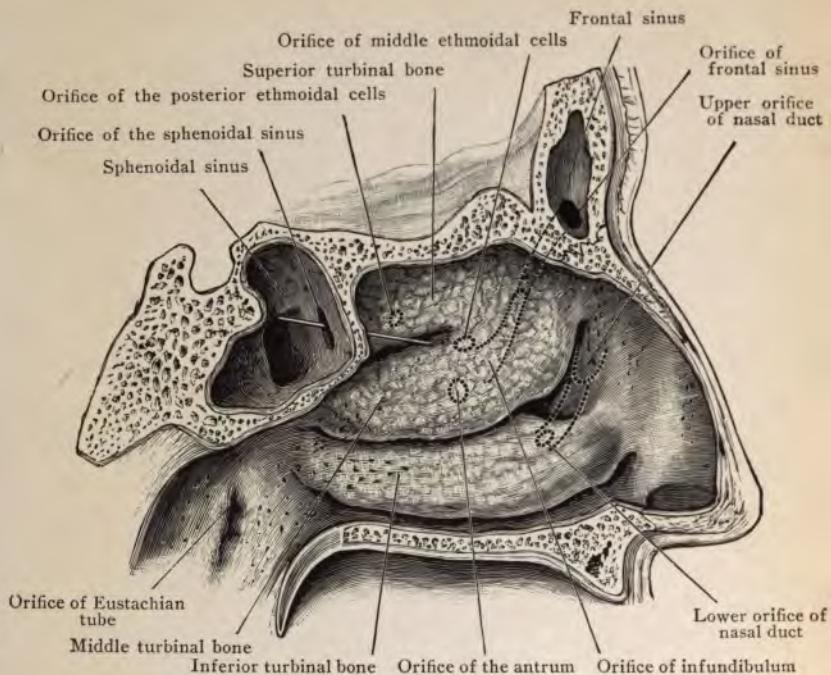


# **HAY-FEVER**

**ITS PREVENTION AND CURE**







SECTION OF THE NOSE, SHOWING THE TURBINAL BONES AND MEATUSES  
WITH THE OPENINGS IN DOTTED OUTLINE.  
(After Morris' "Text-Book of Anatomy.")

# HAY-FEVER

ITS PREVENTION AND CURE

BY

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## PREFACE

HAVING had remarkable and uniform success with a simple treatment of hay-fever for the last twenty years, during which time I have given complete relief to many patients in my private practise, and having made a thoro clinical study of this affection, as well as an exhaustive review of the literature relative to it, I feel justified in presenting the results of my labors in this short treatise.

There is little to be said definitely about the etiology of the disease. It is undoubtedly caused by an external irritant, possibly containing a micro-organism or a toxin, which becomes especially active in the nasal passages of an individual predisposed by systemic debility or local

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## PREFACE

abnormality. We acknowledge the element of neurotic disturbance, but to dogmatically define its exact cause and *modus operandi* is beyond us.

In order that the best thought of the subject may be presented to the reader, I have compiled, arranged, and annotated the most worthy literature, and I acknowledge my indebtedness to the many writers quoted. The most of my original communication is devoted to the all-important point in the discussion—the successful treatment. A complete bibliography is appended.

W. C. HOLLOPETER.

## INTRODUCTION

HAY-FEVER has become so well-known and is so universal a disease that many State organizations have been formed for its careful study; we are thus hopeful of some positive developments in the better management of hay-fever by concerted effort of the sanitarian and physician. The choice of a name has not been very fortunate, as it has been discovered that hay in itself has very little, or nothing, to do with the cause. I give, however, a few synonyms in the early part of the book.

Next to tuberculosis, hay-fever is one of the most interesting and common diseases, and has received an enormous amount of study. While it is not directly fatal, it is exceedingly distressing and is

## INTRODUCTION

certain by its annual visitation to lower the vital resistance and induce other illness in the body. In this way it becomes a prolonged and serious menace to the comfort and happiness of the sufferer. Hay-fever was not regarded frequent in the young until a more careful study of autumnal and spring catarrhs among neurotic children revealed the fact that the same troublesome complaint had occurred the previous season. The frequency of "cold taking" among children is due to their lowered vitality, the result being adenoids and enlarged tonsils which often precede the typical hay-fever.

It has been found that children, especially the neurotic offspring of nervous parents, are as subject to hay-fever as adults, if not more so, for we certainly have an ever-enlarging army of catarrhal children. There is no doubt that in every

## INTRODUCTION

class hay-fever is decidedly on the increase in America. True hay-fever is also found in great masses of thoughtful adults, who are prone to forget the previous attacks, altho they may have had many annual visitations of the disorder. Some slight exposure or irregularity of diet, or an unusual change in the atmosphere, suffice to explain the indisposition, and satisfies the mind for the time. It is certain that a large number of hay-fever sufferers forget from year to year the annual visitation; this is more likely if the attack has not been severe. Furthermore, it has been most conclusively proved by many authorities that hay-fever does not occur unless we have a conjunction of three necessary factors:

1. An external air-borne irritant.
2. A sensitive or diseased nasal mucous membrane.

## INTRODUCTION

### 3. An unstable nerve-center.

Upon the simultaneous manifestation of these three factors in any individual we are reasonably sure in making a diagnosis of hay-fever. An absence of any one of the three admits at once of distinct doubt.

The claim for originality in this thesis lies in the fact that the author recognizes the three essential factors, as stated above, as the cause of hay-fever and claiming that the remedy lies in controlling or destroying the habit, by inhibiting or numbing the sensitive nasal surface by local cleansing and massage. The literature of hay-fever has grown so very prolifically in the last five years that to follow it out in detail would be a difficult and useless task. Most writers agree as to the three essential causative factors, and volumes have been written in discussion of their different phases.

## INTRODUCTION

Dr. Geo. M. Beard, one of the earlier and most exhaustive writers, regards it as a neurosis, due to an unstable brain-center, and a functional disease of the nervous system, thus ignoring all environment, climate and nasal conditions. Sajous, on the other hand, regards the trouble as one of local origin, ignoring heredity and neurosis, and finds an abnormal nasal chamber in all active cases. They both concede external irritants as essentially necessary to the initial paroxysm, but regard this of secondary importance. It was not until Prof. Dunbar and his followers made their exhaustive studies of pollen that we arrived at any satisfactory scientific knowledge as to the exact nature of this "external irritant," and applied the antidote for its control. Literature on hay-fever during the past ten years has centered largely on discussion of these studies. It

## INTRODUCTION

is for this reason that I have given Dunbar so large a space in my book. I have allowed him to speak for himself.

In my first published paper in 1898, I stated that I had succeeded in controlling a large number of cases by "scrubbing most carefully every portion of the mucous membrane of the nasal chamber, being sure to reach between the turbinated bones and all around any slight prominence." Musser and Kelly ("Practical Treatment," 1913, Saunders, Philadelphia) quote E. W. Wright as placing great stress upon the hypersensitive condition of the nasal mucosa as the important causative factor in many cases, suggesting a frictional massage of the mucous membrane of the nose in order to increase its resisting powers, so that it can withstand the irritation and excitation from the impact of the pollen of plants.

## INTRODUCTION

His method is to apply gentle massage to the nasal mucous membrane through the medium of a cotton-covered probe. These applications are to be made daily for from three to five minutes in each nasal chamber.

I am unable to find any additional authority for this method of management of the disease. The observation of Wright was made long after the publication of my paper; and certainly priority for such local treatment belongs to me.



*PART I*

WHAT HAY-FEVER IS  
HISTORY, PERIODICITY, SYMPTOMS  
AND DIAGNOSIS



## *PART I*

### WHAT HAY-FEVER IS

#### HISTORY, PERIODICITY, SYMPTOMS AND DIAGNOSIS

##### 1. DEFINITION, HISTORY AND BIBLIOGRAPHY

Among the synonyms that have been employed for the term hay-fever may be named the following: Autumnal catarrh, Bostock's catarrh, coryza vasomotoria, coryza vasomotoria periodica, hay-asthma, idiosyncratic coryza, June cold, July cold, nervous coryza, nervous catarrh, paroxysmal sneezing, peach cold, periodic hyperesthetic rhinitis, pollen catarrh, pollen poisoning, pruritic catarrh, pruritic rhinitis, ragweed fever, rhinitis sympathetica, rhinitis vasomotoria, rose catarrh, rose

## HAY-FEVER

cold, summer bronchitis, summer catarrh, summer catarrh from idiosyncrasy, summer fever, typical early summer catarrh, vasomotor coryza, vasomotor rhinitis. In other language are the following equivalents: *Latin*—Catarrhus æstivus, coryza vasomotoria periodica; *French*—Catarrhe d'été, catarrhe de foin; *German*—Früh-sommerkatarrh, Heuasthma, Heufieber; *Italian*—Asma dei mietitori, febbre del fieno, asma del fieno.

The term “hay-fever” was first used to designate the form of disease occurring in the autumn in distinction from like affections which occur in other seasons. So universal, however, has become its use that it is now employed to designate all the forms of what may be called the periodic influenzas, irrespective of seasons.

Hay-fever may be defined as an affection of the upper air-passages occurring

## WHAT HAY-FEVER IS

periodically, usually at or near a fixt date in the early autumn, sometimes in the spring or summer, characterized by its sudden onset and as sudden termination in certain atmospheric conditions, by swelling and turgescence of mucous membranes of the nasal fossæ and adjacent cavities, irritating discharges therefrom, and various symptoms of coryza, and occasionally by asthmatic paroxysms. It always results from the combination of a special predisposition, from depraved resistance or lowered vitality of the general system or a local lesion, and an exciting cause, believed to be a micro-organism or peculiar toxin, generally arising from pollen or dust deposited upon or in the mucous membrane of the upper air-passages. The important predisposing causes are: heredity, idiosyncrasy, neurotic temperament, peculiar susceptibility of the vasomotor

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system, generally debilitated condition, deranged assimilation, and a local lesion. Hay-fever has been defined as a neurosis, as an idiosyncrasy, as a catarrhal affection, and as a type of influenza, and as various combinations of these. The deposition of some special irritant is universally regarded as the exciting cause.

Exactly when hay-fever was recognized as a distinct affection is not known. Beschorner shows that it was known in the sixteenth century. In 1565 Botallus reported a case. Van Helmont and Binninger, in the seventeenth century, speak of it. A similar distressing catarrhal affection, but due to the rose, is instanced in "Acta nat. curios. Ephemerides," Dec. II, Ann. V, obs. 22, and again in the same journal, Dec. III, Ann. V and VI, obs. 193, a case of annually recurring profuse nasal catarrh is mentioned. John Floyer,

## WHAT HAY-FEVER IS

London, 1698, noticed that there were peculiar cases of asthma in which the attacks were longer and more acute in summer than in winter. In Good's "Study of Medicine" there is a reference to a case related by Timæus in 1667, of an attack of an asthmatic nature caused by the odor of roses and ipecac. Riedlin, in his "Lin. Med.," p. 177, in 1695, wrote of the odor of roses causing a catarrh of the head, resembling hay-fever. C. L. Parry, of London, records a case in 1809 and another in 1811. Elliotson, in 1821, tells of a patient who had had hay-fever since 1789, and of another who was sixty-six years of age and who had had the disease from his seventh year, *i.e.*, since 1755, and of a third who had been afflicted for many years.

Just when and where the term "hay-fever" or "hay-asthma" arose it is im-

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possible to say, but probably it was popularly so named. The emanations from dry hay were first thought to have caused it. Dr. Bostock, who was himself a sufferer, in 1819, found that the laity knew of the affection, altho it was not recognized as a distinct disease by the profession. He objected to the term "hay-fever," which was already employed to designate it in his day, contending that moist heat, sunshine, dust, and fatigue were more potent in its causation than emanations from dry hay. It seems remarkable that the profession in England were unfamiliar with hay-fever as a distinct affliction, especially as their king, George IV, was a sufferer from it. In 1828, Bostock, who had first described the disease to the Medico-Chirurgical Society of London as a "case of a periodic affection of the eyes and chest," published some further ob-

## WHAT HAY-FEVER IS

servations on the complaint under the title "Summer Catarrh," or "Catarrhus *Æstivus*." In 1828, MacCulloch included it in his "An Essay on the Remittent and Intermittent Diseases," but advanced no special views. In 1830, Augustus Prater published notes of a case seen in Paris. In 1831, Dr. Elliotson, in London, briefly described the affection; and in 1833 he discuss the complaint more fully and opposed Bostock's theory of heat and rejected the hay-theory of its origin, but declared grasses to be more important factors; and he first pointed to pollen as the probable cause of the disease. In 1847, Dr. Ramadge detailed reports of cases and believed "effluvia from flowers" caused it. In 1850, Gream first alluded to dust as an exciting cause and proposed *nux vomica* as a remedy. In 1852 Dr. Laforgue, of Toulouse, wrote his essay "Observation

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de catarrhe d'été," in which he upheld heat as the cause, after the view of Bostock. But in the next year, 1853, in "L'Abeille Médicale," an anonymous contributor, reciting his own case, advocated hay-emanations and not heat as the exciting agent. In 1854 Phœbus, of Giessen, concluded from his study of 154 cases that sunlight was the active cause of the attacks. In 1857 Watson ascribed the malady to the presence of vegetable matter in the atmosphere. In 1859 Phœbus again published the results of his circular of inquiry. He went into the subject more thoroughly than any of his predecessors, and from sunlight he shifted to ozone as the theoretic cause of the malady. In this same year Hyde Salter named as the exciting agents "bright, hot, dusty sunshine," a full meal, and hay, and recited two interesting cases. Another writer,

## WHAT HAY-FEVER IS

Walshe, in the same year, referred to hay-fever as a singular variety of nasopulmonary catarrh, and he first called attention to the fact that the disease, in his own person, "always disappeared in crossing the Atlantic."

In July, 1860, Dr. Cornaz, of Neufchâtel, Switzerland, in a paper on hay-fever, described six cases, and concluded that the flowers of grasses were the cause of the disease, and he was followed on the 20th of August of the same year by Dr. Labosse, of Nitry, France, in a paper entitled "*Nouvelle observation de catarrhe de foin,*" in which he spoke of three persons whose symptoms occurred at the time certain flowers were in bloom. In 1866 strong light and great heat were advanced as aggravating causes by Dr. Wm. Abbotts Smith. In his published work, "*On Hay-fever, Hay-asthma, or Summer Ca-*

## HAY-FEVER

tarrh," he rejected the ozone theory of Phœbus.

In 1867 the nervous origin of the disease was first advanced by Dr. William Pirrie, who spoke of two forms,—one a spasmodic form caused by external irritants, the other arising from the action of light and heat upon the central nervous, the cerebrospinal, and sympathetic systems. In the same year, Helmholtz, who, tho not a general practitioner, while suffering from hay-fever, began to treat it with a quinin solution and found that he was relieved thereby. Two years later he detailed to C. Binz, of Bonn, Germany, by letter, the history of his sufferings, and recommending his solution as a ready means of relief and even of prevention, which was in accord with the findings of Binz that the quinin solution was poisonous to infusoria. In this letter Helmholtz

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propounded the theory that the symptoms were caused by vibrios which, tho latent at other times in the nasal fossæ and sinuses, were excited to activity by the heat of summer. It has since been thought that the organisms found by Helmholtz, by means of the microscope, in the nasal discharges during an attack were probably fragments of mycelium-like threads which develop from pollen-cells under the influence of the heat and moisture of the nasal chambers and which contain the minute fovilla of the pollen-cells. The use of the quinin solution which Helmholtz so successfully employed on himself became very popular and found many strong advocates in the profession until the extensive researches of Blackley in regard to pollen in 1873. In the meantime, in 1870, Dr. George Moore advocated a complex theory of the disease, really com-

## HAY-FEVER

bination of preceding theories. In the same year Roberts issued a short, practical paper, claiming to be the first to observe excessive coldness of the tip of the nose as the "pathognomonic" symptom of hay-fever and desiring credit to be accorded him for this discovery.

In 1872, Morrill Wyman, of Cambridge, Mass., distinguished two different forms of the disease; naming that occurring in August "autumnal catarrh," peculiar to America, and that of the spring or early summer "June cold" or "rose-cold," more prevalent in England.

Dr. Wyman first attempted to define the geographical limits of the disease, and called attention to the important fact that residence in certain elevated regions brought certain and complete relief in most cases of autumnal catarrh. He stated that a lady from Lynn, Mass., a

## WHAT HAY-FEVER IS

great sufferer, accidentally observed in 1853 that her catarrh passed by while she was traveling in the White Mountains, and that for the following ten years she visited the region and escaped the disease. In 1860, Jacob Horton, of Newburyport, Mass., wrote Dr. Wyman that the White Mountains gave the only relief. In 1873, Charles H. Blackley, of Manchester, endeavored to show that pollen mainly, if not exclusively, caused the malady, and by extensive experiments showed that the amount of pollen in the atmosphere at great elevations was to that in the air at ordinary breathing levels as nineteen to one. He proved, by very ingenious and carefully conducted series of experiments, that the pollen of grasses and flowers was the sole cause of hay-fever in himself, and that in two other patients the severity of the attacks was directly related to the

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amount of pollen in the air. His subsequent observations made it extremely probable that pollen is an important factor in the causation of hay-fever, altho all kinds of dust may be sufficiently irritating to excite the paroxysms. This was in opposition to the views of Phœbus and of Pirrie, both of whom suggested heat, strong light, and ozone as the exciting causes. Pirrie had also suggested disturbance of the central nervous system as an important etiologic factor. He was supported in this view in 1876 by Morrill Wyman, then of New York. In the same year Beard, of New York, published his monograph, the information for which had been painstakingly gathered from replies to two hundred circulars which he had issued to medical men all over America, somewhat after the manner of Phœbus; altho, unlike Phœbus, Beard had himself

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seen and treated many cases. From his data he drew the conclusion that the immediate exciting causes were more than thirty in number, and that secondary causes might increase this list to more than one hundred. He showed also from his statistics that the nervous temperament existed in a great proportion of the sufferers, and that nerve tonics were of some value. In 1877, Marsh, of Tuckerton, New Jersey, published an essay in which he accepted completely the pollen theory. He first called attention, in this paper, to the activity of the pollen of *Ambrosia artemisiæfolia*, or common ragweed, as by far the most active of the pollens in America in producing the attacks.

In 1882, Daly, of Pittsburgh, first called attention to the fact that a diseased condition of the nasal cavities was an important factor in the production of the exacer-

## HAY-FEVER

bations of the disease. Roe, of Rochester, in 1883, advocated the same theory, but added that "removal of the diseased tissue removes susceptibility to future attacks." In the same year, Sajous' essay appeared in which he advanced idiosyncrasy as a heretofore unconsidered element in the cause of hay-fever, and laid stress upon the three essential factors in the production of an attack; viz., first, an external irritant, second, a predisposition of the system, and, third, a vulnerable or sensitive area. In 1883, Hack accepted the local theory of the causation of the disease. In 1884, Harrison Allen, of Philadelphia, attributed the affection to a permanent or temporary obstruction of one or both nasal chambers. In the same year, J. N. Mackenzie, of Baltimore, termed the disease "coryza vasomotoria periodica," because it is essentially a coryza. He

## WHAT HAY-FEVER IS

says: "The well-recognized, but imperfectly understood personal susceptibility to certain forms of local irritation, which is the sad prerogative of sufferers from this disease, has always been the stumbling-block in its investigation and the rock upon which the various speculations as to its nature have been wrecked." He demonstrated that "there exists in the nose a well-defined sensitive area whose stimulation, through a pathologic process or through *ab extra* irritation, is capable of producing an excitation which finds its expression in a reflex act or in a series of reflected phenomena." He thus claimed functional derangement of nerve-centers as essential to the disease. It was also in 1884 that Sir Morell Mackenzie asserted that the universal cause of the disease was pollen, altho he did not deny that other irritating particles, *e.g.*, ipecac, if per-

## HAY-FEVER

sistently brought in contact with the mucous membrane of the nasal chambers, may produce it.

In 1885 Seth S. Bishop advocated the uric acid theory of the origin of the disease.

In 1887 Sir Andrew Clark, in the Cavendish Lecture in London, emphasized the doctrine of the three great causative factors,—viz., first an exciting agent, generally pollen; second, the neurotic habit; and, third, a local morbid condition of the nasal mucous membrane.

Since then many articles have appeared upon the subject, but no striking innovations in the possible etiology of hay-fever have been offered.

In 1893, Macdonald said, we ought not to describe hay-fever as a disease but merely as a train of symptoms—a train of physiologic reflexes instigated by an

## WHAT HAY-FEVER IS

unwarrantably small provocation in certain individuals more susceptible to the influence thereof than the rest of their kind.

Early in 1897, Grayson, of Philadelphia, stated that "the neurotic habit may exist but is not essential to the disease, and the nervous system is implicated as a victim, not as a culprit." He claimed that hay-fever is a defect, not of the nervous, but of the nutritive system, believing that the digestive tract is the cradle of the systemic error.

In October, 1897, Edmund W. Holmes, of Philadelphia, stated his belief to be that hay-fever was largely a neurosis, originating in local disease of the nasopharynx, the characteristic manifestations being in part direct, the result of central nervous modifications, and in part reflex, from the action of various mechanical ir-

## HAY-FEVER

ritants, aided by local and constitutional factors when they exist, and by seasonable and climatic influences, the periodic and peripheric susceptibility being in particular expressions of certain impressions.

### 2. CAUSES

The idea of an external irritant in hay-fever pervades most views of it. There can be no doubt, however, that there is usually an underlying systemic condition which renders individuals susceptible to the disease. It may, in addition, be accepted as conclusive that the nasal abnormalities found in hay-fever subjects are as often incidental as causative. They are seldom exclusively provocative of the susceptibility, and they are not the results of repeated attacks. Exactly what this underlying condition of susceptibility is has been variously regarded. The nature

## WHAT HAY-FEVER IS

of the irritant has been widely and scientifically investigated. While all theories advanced are in part more or less tenable, none of them alone is satisfactory. The condition is always, however, one of *lowered resistance*, general or local. If general, it may be of neurotic, lithemic, idiosyncratic, gastric, intestinal, or diathetic origin. It is, therefore, my belief, that in hay-fever there is always, first, an exciting agent, and, second, a system predisposed by debility of some character to the influence of this irritant. The overwhelming testimony as to the character of this irritant points to its derivation from something external to the body of the sufferer. Moreover, it is absolutely certain that without the action of an external irritant genuine hay-fever does not occur. The elaborate and ingenious experiments of Blackley, not only upon himself but upon

## HAY-FEVER

other individuals, clearly indicated the pollen of flowering plants as an active, exciting cause. It has never been shown that, altho pollen, healthy or unhealthy, may be a mechanical irritant and thus account for many cases, it is not also a chemic irritant when it has fallen upon a susceptible soil. It has been claimed that hay-fever is caused by a toxin generated by a fermentative process in the pollen which has fallen into the alkaline solution of the nose; and it has been shown that acid solutions stop the movements of many micro-organisms and spermatozoa, and that alkaline solutions in the nares have given little or no benefit in attacks of hay-fever. It has also been shown that the affection is more common among men than among women, and that the blood of the latter is the less alkaline.

## WHAT HAY-FEVER IS

Arnold, in 1896, stated that just what constitutes the irritant is not determined, and said it is likely that not healthy pollen but some fungoid growth is responsible, since threshers of grain, at other times without ill-effects, have complained of attacks of hay-fever after threshing smutty or moldy grain, especially oats.

Helmholtz, himself a sufferer from hay-fever, discovered peculiar micro-organisms in his nasal discharges. These vibrios were never found by others, and this fact is supposed to controvert his theory. It has not been shown conclusively that they have been sought for by other investigators, and it is likely that they have not, since attention has been called away by the pollen and other theories. The antiseptic quinin solution employed by Helmholtz, while extensively used with good results for the subsequent decade,

## HAY-FEVER

was not invariably accompanied by relief. Later, the relief that was given by quinin solutions was said to be psychic. This allegation may well be understood when it is considered that many other theories as to the causation of hay-fever, particularly the pollen, abounded soon after Helmholtz's expositions.

Some very interesting investigations by Strangways, of St. Louis, in 1897, urged him to conclude the amount of pollen in the air is altogether too small to have an injurious mechanical, medicinal, or poisonous influence. He calculates that for every square foot of surface there is one ragweed, and inquiry showed that mere elevation of several hundred feet above the earth's surface does not give relief from this distressing affection. Strangways found that ragweed pollen probably floats to 1,000 feet elevation; but, if the

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limit is placed at 500 feet, it would give for every plant 500,000 cubic feet of air, not for one day but for six weeks; *i.e.*, if the whole plant was pollen there would be still only one part of pollen to fifteen or twenty billion parts of air. The rose and the goldenrod are in even smaller quantities. Strangways' estimates showed that there was not more than one grain of pollen for every thirty respirations. He advanced the theory that, while pollen plays a part, it does not irritate mucous membrane nor produce vasomotor paresis by its direct influence, but that a protoplasmic substance found in pollen and in the vegetable kingdom, acting as a ferment, causes the formation of a toxin which is the real exciting cause.

There can be little doubt that the neurotic element has been present in many, if not most, cases of hay-fever, and evi-

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denced by depression, general lowering of tone, or exhaustion of the nervous system. The neurosis need not be acquired; in fact, it is often hereditary, which will be discuss later.

Holmes believes the disease to be in great part a neurosis with other debilitating conditions. The fact that the better educated classes are most prone to this affection indicates the influence of neurotic tendency as well as exhaustion of the nervous system or debility or depression thereof. The premonitory symptoms of this affection, as ably shown by Sajous, show the neurotic elements. He well asks, "If the local irritant is the only cause, why does the respiratory tract, the portion of the body first and most exposed to its effects, not become immediately influenced?" This author also shows a case following enteric fever, the debilita-

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ting and exhaustive character of which is well known, one preceded by malarial fever and another by bronchitis, pertussis, and varicella.

Of the various other theories advanced are the lithemic, the intestinal or gastric, due to lack of proper assimilation, and the uric acid diathesis. The views herein advanced are not at all inconsistent with the idea that the diatheses exercise a predisposing influence in producing the affection, which influence is debilitating and devitalizing.

The local theory alone is not conclusive nor satisfactory; viz., that the disease is due to chronic nasal catarrh, or a local lesion, upon which the exciting cause acts. There is no doubt that diseased areas are more sensitive to the irritant, and especially so in cases of lowered vital energy and lessened normal resistance, general or

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local; but a large number of cases show no local disease.

In all of the theories respecting this affection there is more or less regard for the agency of pollen in provoking the paroxysms of the disease; but as every one is exposed to the irritant, in those affected the soil must be prepared for the seed, that is, before the deposition of the pollen or dust or exciting agent there must be a morbid condition preexisting, which can so far be characterized as to call it lowered vitality or general or local resistance, which springs from a variety of causes.

### 3. PERIODICITY

On the continent of Europe, where it is less frequent, and in England, hay-fever prevails in June and July. The initial attacks occur during May and June and seldom last longer than September.

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In India the malady chiefly occurs in February. In Australia, in and around Adelaide, where the disease prevails, it occurs chiefly in September during the time of the blossoming of the Cape weed. In his work on hay-fever, Beard essays to show how the autumnal form is peculiar to the United States. One cause seems to be the flowering of the Roman wormweed and the pollen of corn about the middle of August, and another in the prevalence of the "dog-days." A third reason lies in the fact that there is less atmospheric ozone and electricity at this period than at any other time of the year, and, again, the hottest days are frequently in the latter part of June. Beard also attached importance to a variety of hay-fever in which the attacks came on in September. This distinction is probably due to the fact that while one person is liable to the

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action of one pollen, another may be affected by a totally different pollen, and the annual attacks come on when the atmosphere is permeated by a special pollen to which the victim is individually susceptible. Many persons are susceptible to the action of more than one pollen. Patients often suffer from rose-colds in early summer, and, again, in August, from the autumnal form of hay-fever. Of the 198 cases collected by Beard the onset of the disease occurred—

From May 1 to May 10, in	2 cases.
" " 10 "	31, " 6 "
" June 1 "	June 10, " 11 - "
" " 10 "	30, " 8 - "
" July 1 "	July 10, " 6 "
" " 10 "	20, " 6 "
" " 20 "	31, " 7 "
" Aug. 1 "	Aug. 10, " 7 "
" " 10 "	20, " 81 "
" " 20 "	31, " 54 "
" Sept. 1 "	Sept 10, " 7 "
" " 10 "	20, " 1 case.
" " 20 "	30, " 2 cases.

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Of Bosworth's eighty cases the greatest number, fifty-one, occurred between August 10th and August 27th. The usual date assigned for the commencement of paroxysms of hay-fever is the 29th of August. This form of the disease, commencing in the latter part of August, is designated as autumnal catarrh.

Many patients have asserted that they are attacked annually on exactly the same date, and even the same time of day, each year. There can be little doubt that the psychic influence or peculiar mental anticipation may have a great deal to do with this circumstance. An attack may be brought on by the influence of the imagination. Phœbus gives the history of a case in which attacks of sneezing were brought on "while looking at a beautiful picture of a hay-field." The well-known instance of J. N. Mackenzie, in which an

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attack of hay-fever was brought on in a susceptible individual subject to rose-cold by means of an artificial rose may be explained on this ground. Bosworth considers that the time of occurrence is influenced by psychic causes, and is analogous to the recurrence of chills in intermittent fever, and considers that deception as to the actual time of occurrence might be proved in hay-fever as in intermittent fever, in which changing the hands of the clock may lead to a change in the regular recurrence of the chills. Prince gives the history of a case in which a hay-fever subject under the influence of auto-suggestion, by means of writing frequently on paper and thinking, day and night, in leisure moments, and of slight hypnotism, prevented the premonitory symptoms of hay-fever, and she was free from the annual attacks for several years,

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when they recurred and continued yearly thereafter. Prince asks, may it not be that the reason why certain places, such as Dublin, for instance, are reputed to have a specific influence against attacks, is the counter-suggestion thereby given that the patient will be free from attacks at such places?

Pirrie states that it is next to impossible to definitely decide the duration of hay-fever attacks, as seasons, age, temperament, locality, treatment, and other circumstances tend to cause variations in different years and in different individuals. Treatment will do much to curtail the duration of the more prominent and distressing symptoms, but if left to themselves it is seldom they depart under three or four weeks. A writer in the "Twentieth Century Practice of Medicine" estimates the duration as from four

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to six weeks, according to the patient's surroundings and the atmospheric conditions. Asthmatic attacks may last from a few hours to three days and disappear suddenly. Morell Mackenzie states that attacks last from a few hours to several days, or even longer, finally ceasing almost as suddenly as they came, and leaving no trace either in local lesions or in systemic disturbance. Bosworth gives eighty cases, showing the durations of the annual attacks as follows:

From May 1 to frost.....	1 case.
" " 15 " May 25, to July 1....	3 cases.
" " 10 " Aug. 1.....	1 case.
" June 1 " July 1.....	2 cases.
" " 1 " " 14.....	1 case.
" " 1 " frost.....	5 cases.
" " 10 " July 4.....	4 "
" " 10 " " 26.....	5 "
" July 1 " Sept. 1.....	1 case.
" " 10 " Aug. 1.....	1 "
" " 10 " Sept. 1.....	1 "
" " 25 " frost.....	4 cases.
" Aug. 10 " Aug. 27, to frost.....	51 "

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All forms of hay-fever terminate with the first frost, and the long interval in which one may suffer is shown by the first case above from May 1st to cold weather. In the United States some who are attacked in May recover by the 1st of July; some attacked in July are well by the 15th of August; some attacked in August recover by November 1st, while some unfortunates suffer throughout the period from May to November. The June type may be followed by a September visitation or become a permanent August attack, or the August type may disappear in certain individuals and reappear as a June cold.

### 4. SYMPTOMS

Altho the affection is called hay-fever, there is seldom any degree of pyrexia, and, as a fever, it is not a decided one. There are two well-known types of

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the disease,—the catarrhal and the asthmatic. The onset of an attack is occasionally marked by feelings of general malaise, a loss of appetite, and depression of spirits. Indeed, these symptoms more or less characterize the entire course of the attack. A “tickling in the roof of the mouth” one week before the onset was felt by a patient of Sajous. Another speaks of dull pains in the head and back two weeks before; chills and shuddering ten days before the attack is experienced by another, while a large proportion complain of palpebral pruritis from two to ten days before the onset of the nasal symptoms. It is only in those subjects whose hay-fever is of some years’ standing, Sajous points out, that the premonitory symptoms are present, and gives in evidence the testimony of a fellow-physician, viz.: “My attacks for some years

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past came with much regularity, about August 12th to August 14th. On these dates this year I arranged to be on the water, on Lake Ontario and the St. Lawrence River, and entirely escaped everything like sneezing and irritation of the nose and eyes. Still I had the usual hot and slightly irritable skin, then an eruption of urticaria, accompanied by disordered stomach. This experience is precisely the same as in 1880, except that then I was on the Atlantic." Macdonald, in 1893, had a patient whose earliest symptoms were a curious coldness and pallor of the nose even in warm weather. In this connection it may be observed that in 1870 Roberts conceived the "pathognomonic symptom" to be coldness of the tip of the nose.

Beard divided the symptoms into local and constitutional. Among the latter he

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regarded fever, loss of strength, the altered appetite and the nervous system, considering under this last, depression, indisposition to labor, sense of fulness and heaviness of the head, pain in the forehead and behind the ears, partial deafness, restlessness at night, inability to sleep, a sense of suffocation, and general irritability. For the local phenomena, he looked upon the skin, in the heart, chest, mouth and nose, eyes and ears.

The periodicity of the attacks is a prominent symptom and is difficult to explain. Some peculiar psychic influence occasionally acts to precipitate an exacerbation. In no other way can we explain the cases of John N. Mackenzie and Morell MacKenzie already cited. Analogous to this remarkable periodicity are those cases of intermittent fever wherein each alternate day, at a given hour, the chill occurs. This

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is generally true, moreover, not only of ourselves, but of the world around us. As Holmes has beautifully shown in this connection, health and disease afford abundant illustration: The fixation of the number of heart-beats, of the respiratory movements, of the cycle of menstruation, or of the period of gestation are all recognizable in their unfailing occurrence, but their determination thereof, then, rather than at some other period, can not be explained. So, in disease, are the mutations of the enteric temperature, the recurrence of the hectic, of the regularity of the return of the type of ague upon the second, third, or fourth days, or of hay-fever upon its annual date. We must recognize these phenomena as fixt, further we can not go. "As the rhythm of physiologic effects is under the control of the central nerve ganglia, and as inter-

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mittency is a peculiarly marked feature of so-called nervous disorders, so far the annual return and the variations are evidences of the neurotic origin of hay-fever.”

The onset of an attack of hay-fever begins with a sense of irritation referred to the upper nasal chambers, a sense of fulness or tightness across the bridge of the nose. There is an itching or burning sensation of the inner canthus of one or both eyes, which may be accompanied by convulsive movements of the eyelid, an itching or tingling in the roof of the mouth. Spasmodic sneezing soon occurs, and pain in the eyeballs and in the frontal regions develops. The paroxysms are more or less violent and prolonged. Arnold tells of sneezing in a patient for twenty-five times in close succession, forcing the pulse at the height of the attack

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to one hundred and twenty beats to the minute. These paroxysms are followed by an abundant, thin, serous discharge from the nose. The mucous membrane of the nasal fossæ swells so as to block up the nasal passages, and respiration through the nares becomes impossible. The escape of serum from the nostrils seems to increase the intense irritation and makes the sneezing worse. The discharge from both eyes and nose gradually grows thicker and may become semipurulent. There is often a certain amount of painful vision, and sometimes swelling, besides the usual pricking and stinging of the conjunctival surfaces. There are frequent transient paroxysms of lacrimation, and there is often much swelling of the eyelids as well as of the conjunctiva. The face becomes puffy and edematous, and the senses of taste and smell become im-

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paired. The pharynx, mouth, and tonsils share in the engorgement and become red, and simultaneously the inflammation of the eyes, nose, and throat becomes intense and painful. Swallowing may become so difficult that there is little rest night or day. Insomnia is common and is often attended by nervousness and a sense of suffocation out of all proportion to the gravity of the condition. Cough is not a constant feature, but in a considerable proportion of cases it comes on in the second week, and lasts through the attack. Generally it is spasmodic and so incessant at night that sleep is impossible, and there are soreness and pain resulting from the straining of the diaphragm and intercostal muscles. Bronchitis does not usually result, and expectoration is absent or scanty until late. Cough may continue after all other symptoms have ceased.

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The pulse and temperature are not generally altered, but later in the attack the temperature may be raised two or three degrees, doubtless from disturbed rest. A "sufferer" records that, in some, the genito-urinary and rectal passages give the first warning by intense itching and burning. In one instance, a more than generally severe paroxysm induced rupture of the capillaries in the lacrimal caruncle of the right eye, causing engorgement of the organ and displacement of the visual axis, with consequent double vision for some days. The direct and reflex changes in the vocal apparatus vary from loss of timber and harshness to complete inability to utter nasal vowels and consonants.

The disorder varies much in intensity even in the same person within short intervals of time, so as to almost give

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the asthma became a prominent factor, and, again, that victims of hay-asthma finally acquired the perennial form of the disease,—the attacks occurring at all seasons without reference to the presence of pollen in the air.

As already evidenced in Sajous' case, in a number of cases the attacks are preceded by cutaneous eruptions. Laflaive cites cases with urticaria and eczema preceding the onset of hay-fever. Facial pruritis and herpetiform eruptions are occasionally seen. J. N. Mackenzie speaks of an inflammation of the external auditory meatus in all respects analogous to that of the nose in hay-fever, occurring repeatedly in a lady during the summer months.

Besides asthma, already mentioned, there is little tendency to permanent ill-effects except thickening of the nasal mu-

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cous membrane from the prolonged irritation. Taste and smell may be impaired during and for a long time after the attack. General irritability and nervousness may be more or less persistent. Elderly sufferers for a long time may have weakened hearts which intermit during attacks, which may recover with returning health or result in cardiac dilatation. Wyman mentions pneumonia in three cases during attacks. In one case the catarrh ceased for two weeks to return after the pneumonia disappeared, when asthma also came on for the first time.

### 5. ITS PATHOLOGY, DIAGNOSIS AND PROGNOSIS

Morell Mackenzie states that hay-fever, leaving no permanent structural lesion behind it, can not, therefore, be strictly said to have any pathology. Surely it is that

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no distinct specific organisms have been found. Sajous calls attention to the distinct physiologic functions of the two regions of the nasal cavities, the olfactory and the respiratory. The filaments of the olfactory nerve cover the superior turbinated bones, and the upper third of the middle turbinated bones, and the corresponding portion of the septum. Thus the upper portions of the nasal cavities are devoted to the sense of smell and do not enter into the pathology of hay-fever. The respiratory portion of the nose includes all the surfaces below the olfactory. It is under the control of the vaso-motor nerves of the sympathetic system, and is quite sensitive to local or peripheral irritation. This sensitiveness resides in the terminal filaments of the sensory nerves, distributed over the surfaces of the mucous membranes. The mem-

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branes of the posterior areas of the nasal fossæ are supplied with several branches of the sphenopalatine ganglion, which enter by the sphenopalatine foramen. This ganglion possesses a sympathetic root derived from the carotid plexus through the vidian nerve, thus establishing a connecting link between the nasal mucous membrane and the sympathetic system.

In health the nasal mucous membrane pours out from twelve to sixteen ounces of watery serum daily, which—that it may warm, moisten, and cleanse the inspired air on its passage to the lungs—is diffused over the convex surfaces of the turbinate bones. The centers in the medulla, through the vasomotor, control and regulate this process of serous exudation; the nicety of which regulation is seen in the adjustment thereof to the varying hygroscopic and thermic conditions of the air.

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The experiments of John N. Mackenzie, in 1884, showed:

1. That in the nose there exists a well-defined sensitive area whose stimulation, through a local pathologic process or through an extra irritation, is capable of producing an excitation which finds its expression in a reflex act, or in a series of reflected phenomena.
2. That this sensitive area corresponds, in all probability, with that portion of the nasal mucous membrane covering the turbinated corpora cavernosa and the most sensitive spots covering the posterior end of the inferior turbinated body and the septum immediately opposite.
3. That nasal cough is caused only by stimulation of this area.
4. That the tendency to evolution of reflex phenomena varies in different individuals, and is probably dependent upon

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the varying degree of excitability of the erectile tissue.

These sensitive areas correspond to the distribution of the sphenopalatine branches of the superior maxillary nerve, as distinguished from the nasal branch of the ophthalmic, which latter supplies the more anterior portions of the nasal fossæ. The former nerves, derived through the ganglion of Meckel, therefore, probably contain the vasomotor nerves which govern the erection of the turbinated tissue, and, hence, the localization of the sensitive areas becomes the key to the mechanism of the paroxysms. Nevertheless, Beard was inclined to transfer the point of greatest excitability from the peripheral ends of the nerve-filaments to the nerve-centers themselves, because it seems a more comprehensive explanation of the varied phases of the disease.

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Roe explained that the more frequent occurrence of asthmatic paroxysms at night might be brought about by the gravitation of blood to, or the contact of polypi upon, these sensitive areas. Sajous thought it was evident that there were three areas capable of producing reflex symptoms in the course of a paroxysm of hay-fever, and that the three combined formed the key to the local nervous element, not that the three areas must take part, but in some, one of them, in others, two of them, etc. In the asthmatic cases, he noticed that both anterior and posterior areas were sensitive, the latter especially so.

Capp pointed out two distinct spots or areas of the mucous membrane of the nasal cavities, one at the posterior and one at the anterior extremity of the inferior turbinates, one or both of which

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may be supersensitive in individual cases; also a spot in the anterior nasal chambers at the upper angle formed by the septum. All these are exquisitely sensitive, and, when irritated, produce extensive reflex symptoms. Trouble appears to begin at one or all of the points, while the rest of the Schneiderian membrane is in normal condition; but with sneezing, hyperemia and hyperesthesia ensue, and, through continuity, may extend to throat, ears, and eyes.

In speaking of the three reflex areas, Holmes said that it is regarded that all points of the cavernous tissue are not equally susceptible to irritation; the sensitive areas are the inferior turbinates (the posterior and middle reflex areas) and the portion of the septum immediately opposite, being particularly related to cough and asthma; the anterior, in the

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vestibule, to sneezing, lacrimation, and other catarrhal symptoms. We might compare these reflexes with certain other cases of reflex asthma (not hay-fever) benefited by removal of the tonsils.

Bosworth regarded the continuous sneezing as pathognomonic and holds that the hyperemia is "confined entirely to the large venous sinuses, the capillaries proper not being congested," and speaks of the watery, serous discharge with the bluish-gray "tinge of the mucosa verging on opalescence, the surface of the membrane being covered with slightly viscid, watery serum, which gives it a glassy, semitranslucent aspect."

During an attack of hay-fever the erectile tissues of the nasal passages and the posterior throat become distended, the blood-vessels are engorged, groups of lymph-cells fill the lymphatic spaces, the

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mucous surface is crowded with migrating leucocytes (white blood-corpuscles), younger epithelial cells are vacuolating and proliferating, secretion is increased in quantity and altered in character and composition, sensation is heightened, intensified, altered, or benumbed, and the whole metabolism of the affected region is profoundly disordered. Examination of the lower borders of the turbinated bones will disclose the mucous membranes of the nasal cavities arranged in thick, loose folds, owing to the peculiar distribution of the network of arteries and veins which go to make up "cavernous tissue." It is peculiar to this tissue that it may suddenly be engorged with blood, extremely distending it, and as suddenly emptied and the engorgement relieved. It is especially thick over the inferior turbinated bones and over the lower and posterior part of

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the nasal septum, and also upon the lower edge of the middle turbinate bone. In acute conditions the engorgement and distention soon subside. In chronic states the mucous membrane becomes markedly thickened and the blood-vessels enlarged and tortuous. The subsidence of the engorgement can not occur, and as a result there is a greater or less degree of closure of the nasal passages.

The mucous membrane of the nasal cavities in hay-fever does not present the characteristic features of an acute inflammation. The impact of pollen or exciting irritant causes complete relaxation of the large veins of the turbinate bodies and an exudation of serum, which relaxation continues so long as pollen or the irritant is *in situ*, but as soon as it is removed the normal caliber is again restored and the attack subsides. Deviations of the sep-

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tum or chronic rhinitis are occasionally found concurrent with the disease, but can not be regarded as characteristic.

Hay-fever may be distinguished from asthma, common catarrh, bronchitis, acute rhinitis, remittent fever, and catarrhal conjunctivitis. The salient feature of hay-fever is its periodicity or annual recurrence. This is part of its very nature, is the central point of diagnosis, is its chief characteristic, and to its elucidation, Holmes says, all existing theories tend.

Beard states that hay-fever is like asthma in the following points:

1. It is hereditary;
2. It is more or less periodic;
3. It is paroxysmal;
4. It is correlated to other functional nervous affections;
5. The paroxysms are excited by a great

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variety of irritants; persons being differently affected;

6. It is singularly obstinate and is relieved by the same remedies.

Bosworth considers hay-fever dependent upon:

1. A neurotic habit;
2. Pollen in the atmosphere;
3. A disordered condition of the nasal passages.

While asthma is dependent upon:

1. A general neurotic condition;
2. Obscure conditions of the atmosphere;
3. Diseased bronchial (not nasal) mucous membranes.

It is the comparative suddenness of the onset, as well as its sudden departure, the violent paroxysms of sneezing, and the character of the nasal discharges which are the peculiar features of hay-fever.

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The first attacks are likely to be mistaken for ordinary coryza, but here the abrupt onset, the characteristic edematous puffiness of the eyelids, the absence of constitutional symptoms will indicate the difference. In children, moreover, attacks of hay-fever are most liable to be mistaken for acute colds or rhinitis,—but here, again, the above points may serve to distinguish, together with the sequence of the symptoms, the time of year, and the physical signs of an acute bronchitis, if it extends so far. The approach of cold weather and the coincident departure of the symptoms will make clear a diagnosis, while the history of previous attacks at the season of the year most favorable to hay-fever, the presence of certain irritants, and the general condition of the bodily symptoms may be of aid in distinguishing the affection. In acute rhi-

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nitis there are several stages, viz.: First, a dry stage, lasting for a few, say twelve, hours; second, a serous discharge lasting two or three days; and, third, a muco-purulent discharge for from three to five days,—while the entire attack runs its course in from five to ten days if no complications ensue. In hay-fever there is no dry stage; the discharge from the outset is purely serous and never muco-purulent during the entire course. The nasal discharge in hay-fever is sometimes slightly opaque, and it may contain some few epithelial cells and viscid mucus. In acute rhinitis examination of the nares will show an inflammatory area while hay-fever shows none. Hay-fever is a vaso-motor paresis, and is easily diagnosed from inflammatory coryza by the swollen bluish-gray appearance of the inferior turbinate bones, and by the fact that the

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first train of symptoms continues through to the end. Examination of the nares will disclose occlusion due to the swollen turbinated bones lying in contact with the septum. The appearance of the mucous membrane itself is characteristic and only slightly resembles an inflammatory process. It is markedly swollen, not bright red as in rhinitis, but bluish-gray, covered with a thin, slightly viscid, watery serum, giving it a glassy, semitranslucent, at times opalescent appearance. Again, the marked puffiness of the eyelids, the great suffusion of the eyes, the photophobia, and even epiphora are distinguishing features of hay-fever.

The sensitive areas spoken of, particularly those on the lower and posterior parts of the septum and the inferior turbinated bones, are of value in differentiating hay-fever, and the markedly pro-

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nounced paroxysms of sneezing are very prominent in hay-fever.

People are subject in the changeable climate of spring and early summer to catch colds, and especially is this true of those prone to catarrh. These cases are sometimes mistaken for hay-fever. The readiness, however, with which they yield to anti-catarrhal treatment shows their nature.

The prognosis is invariably good as to life. Sufferers often live to advanced ages. Hay-fever is no bar to life-insurance, but unless rationally treated the chances of permanent cure are very small. There are few exceptions to the rule that the tendency is, when once established, to an annual recurrence, unless the predisposing causes are removed, or there is removal of or away from the exciting cause. Beard states that hay-fever has

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no effect on longevity, and that, judging from observation and analogy, this affliction may act as a kind of safety-valve for the nervous diathesis, preventing other and more serious disorders, and thus becoming the friend rather than the enemy of life. When once attacked, unless properly treated, escape is rare in any subsequent year. Even changes in constitution in extreme age are no bar or protection. It rarely skips a year, provided locality and influence are the same. Absolute immunity is only obtainable at the price of temporary exile. There is no proof that hay-fever is generally milder or severer in certain years all over the world or over a country, yet evidence is satisfactory that in certain localities it varies greatly in different years.

Now and then, but not often, the tendency to the disease seems to be out-

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grown. In one of Beard's cases the disease skipped two years. Dr. Gibbons, of California, mentions a terrible case in which the attacks in successive years became lighter and lighter and finally disappeared entirely.

With respect to increase or decrease of severity of symptoms with advancing years there is no constant law. In some cases the disease grows milder, in others severer, in others still, years of comparative mildness alternate with years of comparative severity. The early form may change into the later form. There is no doubt, however, that attacks may change from the early to the late form, and *vice versa*, and in advancing years may be milder. Bosworth states that the younger the patient the better is the promise of relief; and that rose-cold, belonging more especially to early life, is to be regarded

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more favorably than other forms. Macdonald has observed spontaneous disappearance in children, perhaps due to an increase, *pari passu* with growth and development of nervous stability.

As regards the termination of each individual attack the prognosis is invariably favorable; *cessante causa, cessat effectus*. There is almost equal certainty that with the same causative influences the attacks will reappear upon exposure to the exciting cause. It is peculiar, too, that the disease of one year's standing has proved as obstinate as one of from twenty to thirty years' duration. In these instances it may be a question as to how firmly fixt has become the neurotic habit.

W. W. Bulette, of Colorado, in 1896, as a result of his own experience, made the assertion that more than eighty per cent.

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of hay-fever sufferers can be permanently and effectually cured. Thoro examination of the patient and elimination of every possible source of irritation and pathologic condition are necessary.

I desire to be more emphatic, and from my results in the treatment of over 200 cases during the last twenty years, I believe that the curability of the disease can not be questioned. That all cases can be cured is questionable; but we can unhesitatingly say that *a majority of cases are curable, and that positive relief, without change of residence or inconvenience, can be afforded during the period of occurrence, if treatment is directed along the lines laid down in the following chapter.*

*PART II*  
**ACCEPTED CAUSES**



*PART II*

ACCEPTED CAUSES

**1. WHEN DUE TO SOME EXCITING AGENT  
SUCH AS POLLEN**

It being generally recognized that there are two elements entering into the causation of hay-fever, viz., an exciting agent and a predisposing or preexisting condition, regard will be given the subject of causation from this standpoint.

A great number of agencies have been regarded as the direct causes of this disease, but opinion in the main has assigned pollen as the essential factor, acting upon the preexisting condition or predisposition. It may be better, however, to give a résumé of other agencies before

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regarding this subject of pollen. The most important of these are heat, light, dust, ozone, overexertion, ipecac, lycopodium, coumarin, benzoic acid, chocolate, or several of these in combination.

No attempt to signify or designate a definite cause was made by the early writers until 1819, when Bostock first described the malady and ventured the view that it was due to the influence of solar heat. He attributed his own prolonged sufferings to the exposure to the sun's rays and fatigue.

Some time after, Phœbus attributed the affection to "the first heat of summer," which, he stated, "is a stronger cause than all the grass emanations put together." Phœbus subsequently modified his views so as to regard the first heat of summer as acting only in an indirect manner as an exciting cause, and admitted

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that hay and the blossoms of rye caused exacerbations. It can not be contended, at this day, that heat alone will provoke the disease. In the plains of India when the heat is greatest it is not found, altho later in the year, in the cooler months and before vegetation is burned up, it does appear; but among the hills of India, where the climate is milder and the grasses and cereals are in blossom, hay-fever exists. At sea, when vessels are becalmed and heat is most intense, and in the great heat of the desert hay-fever is not found. Pirrie shows that great heat is common to all cases, even when the vegetable world is looked to for the cause, and strangely points out that the premonitory feelings of an attack coincide with those caused by high temperature. One of the most interesting cases from this standpoint is that of an En-

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glishman, who, altho not a medical man, was well known to science—Richard Proctor. The asthma—for it took this form—occurred only during the cold months, and was always aggravated by a rime or hoar-frost, especially if the latter was followed by a bright, sunny day.

It is a striking fact that in regions comparatively free from the disease persons subject to it become worse on warm days, or when the wind blows from the south. It has been found by experience that while this aggravation by winds is in most part due to the presence of more pollen, the higher temperature is also in a measure responsible. Hot, dry days are more favorable to the dissemination of pollen than rainy ones, and it becomes especially active when hot, dry periods follow stormy weather. In the light of Blackley's experiments upon the amount

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of pollen in the atmosphere, these facts would seem to explain the action of heat and sunlight as an active cause in the production of the exacerbations of hay-fever.

Phœbus was dissatisfied with the view of the influence of solar heat, and thought that the longer days, which produce a more continuous action of light, were perhaps to blame; but where light is strongest and lasts the longest—indeed, in the land of the “midnight sun”—hay-fever is practically unknown. Pirrie called attention to the fact that exposure to strong light aggravated the symptoms of the attack. The cited case of the late Richard Proctor is an example of the truth of this. There is an instance of the widow of a clergyman whose attacks, most severe in summer, were aroused by sunlight in the early morning. Ingals knew a clergyman who was unable to cross the street

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on a hot day without sneezing violently unless he carried an umbrella. Persons with sensitive mucous membranes, especially subjects of hay-fever, are, no doubt, sometimes liable to attacks of sneezing from sunlight; but these symptoms must not be mistaken for true hay-fever. Ingals states that he knew an individual in whom attacks of sneezing were brought on by exposure to bright gaslight. Gaslight was also regarded by Beard as a cause of this affection. However, Morell Mackenzie shows that gaslight is employed more in winter when the affection does not prevail than in the English spring and American autumn, when the affection most prevails. Nothing can exceed the reflected glare of sunlight at sea on a bright day, yet it is upon the sea that exemption from attacks of hay-fever is universally found.

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From his scientific investigations upon the subject, Beard, whose published work is a model, concluded that it was extremely probable that dust occasionally caused hay-fever. Out of 198 cases of hay-fever reported by him no less than 104 attributed the affection to dust. One hundred and forty-two of these cases, however, occurred between May and September, the usual hay-fever season; and the lay, not the trained professional, mind advanced the causes. Some attributed the affection to "indoor dust"; some to "cinders." These data of Beard, therefore, must be taken *cum grano salis*. More especially is this so since a paroxysm of sneezing and subsequent coryza, frequently brought on in normal health by the mechanical irritation of dust or even strong odors, should hardly be dignified as an attack of hay-fever. In England,

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in February, March, and April, when strong east winds often blow clouds of dust against the face, the symptoms of hay-fever do not appear, whereas in June and July, when dust is comparatively little, the affliction is most extant.

Holmes stated that even in winter-time stirring among old books or in an old garret the exposure to the fine dust therefrom would, by simple mechanical irritation, produce an attack in him. It has been the consideration that dust, or pollen, acting as any other form of dust, could be kept from entering the nasal chambers that has given rise to the various inventions to purify the air before it enters the nose, such as plugs of cotton or wool, and veils (which, in addition, soften the glare of the sun and lessen the irritating action of winds. Every hay-fever sufferer knows the little value of such a device.

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From the vast quantity of facts and observations gathered together by him, Phœbus, who previously had ascribed sunlight as the cause of hay-fever, endeavored to extract a complete theory of the disease. He suggested an excess of ozone in the atmosphere as a possible cause. It remained, however, for Blackley, in 1873, by his great endeavors and scientific methods of investigation, to disclose the fallacy of this theory. He purposely breathed air highly charged with ozone for five or six hours without effect; and without inconvenience he inhaled ozone artificially prepared and in quantities far exceeding that found in the same volume of atmospheric air. This same physician also studied upon himself the effects of benzoic acid, a substance shown by Vogel to be contained in *Anthoxanthum odoratum* and *Holcus odoratus*, the

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two species of flowering grasses to which the causation of hay-fever has been attributed. Likewise he investigated the odorous principle of many flowering grasses, coumarin, and the volatile oils which impart to many plants, such as peppermint, juniper, rosemary, and lavender, their characteristic perfume. In all these cases the results were negative.

Various other exciting causes are in numberless variety and many of purely idiosyncratic nature. Emanations from dry hay, sunlight, gaslight, heat, minute organisms as supposed by Helmholtz, the "mange" insect, dusts of all kinds, bad air, railway smoke, brimstone matches, flowers and fruits, odors from dogs, cats, horses, cattle, rabbits, guinea-pigs, and wild animals, have all been held responsible for the paroxysms. Ward Smith records linseed meal and mustard as

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exciting causes. Wm. Murrell mentions powdered May-apple (*podophyllum*), the effluvia of clean pocket handkerchiefs fresh from an ironing table, locust-tree blossoms, mulberry blossoms, and fruit. The exhalations from feathers have been regarded as causes. It is well-known that various drugs like ipecacuanha and lycopodium give rise to attacks, and sulfur has been mentioned as a cause. Sir Thomas Watson names a servant in St. Bartholomew's Hospital affected by ipecac. Cullen tells of an apothecary's wife who, whenever ipecac was triturated in the shop, had an attack of hay-fever. He also mentions the vicinity of a rice-threshing floor as a provocative cause. Itzigson tells of a merchant who had hay-fever paroxysms whenever fresh coffee was handled in his presence; and it is recorded of a dyer that he could not work

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when the wood of the oak (*Quercus tinctoria*) was lying about. The author knows of a case in a physician in whom violent paroxysms of sneezing are induced by the tasting of chocolate. It is related in the "Twentieth Century Practise of Medicine" that a hay-fever patient fond of tomatoes and watermelons was unable to eat of them during the usual hay-fever season without most violent disturbance of the gastro-intestinal tract. Bastian was subject to attacks of an affection like hay-fever while dissecting the *Ascaris megalcephala*, a parasite infecting the horse. Hyde Salter tells of a clergyman affected by the vicinity to a dead hare, and who was thus able to detect the presence of a poacher. H. Charlton Bastian had like effects from the "mange" insect of the horse. Ringer and Murrell tell of a young gentleman

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made worse by the vicinity of horses or stable people. Once, while in the theater, an attack suddenly supervened without any appreciable reason until a horse galloped upon the stage. Macdonald, in 1893, mentioned a patient who, two or three hours after having patted his horse with his gloved hand, inadvertently put it to his face, and was immediately seized with a violent paroxysm. The odor from the inner aspects of the legs of the horse was very irritating to one writer, a "sufferer." Ringer and Murrell cite the case of a gentleman who, subsequent to an acute pleurisy, was ever after a subject of "hair-caterpillar asthma," and was immediately attacked if by any chance he touched a caterpillar.

The difficulty of sometimes finding some exciting agent is shown by the case of Drenger. After searching several

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years in vain for the cause of attacks of hay-fever caused by entry into a certain room in a house, and after ransacking nearly everything in the house, a mattress was suspected, and, upon removal, was satisfactorily shown to be the offending agent.

The odor of peaches, of violets, of the mignonette, of chocolate, of musk, and of peppermint, has come in for a share of the blame. Trosseau relates of himself that attacks came on when he entered a room in which there were violets. The botanist Broussais was often impeded in his work by attacks caused apparently by the odor of a rose. Hünerswolff and Morell MacKenzie each cite a case in which the perfume of the rose produced attacks of coryza. The former's account is in the "Ephemerides," and has been often referred to. The latter's case proved rebel-

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lious to treatment, and the sufferer had, at last, to banish these flowers from her garden. That this peculiar antipathy to flowers is often imaginative is also shown by John N. Mackenzie, who cites the case of a subject of hay-fever to whom he handed an artificial rose. Immediately an attack of rose-cold ensued. A patient mentioned by Phoebe and Morell Mackenzie, while gazing upon a picture of a hay field, was seized with an attack of hay-fever. These last two instances indicate the psychic influence rather than any extraneous cause, but they serve to show the varieties of exciting agents.

The external cause which has been by far the most generally recognized and accepted as the most frequent is pollen. The older writers upon this theory did not distinguish the underlying condition necessary before pollen could act as a cause of

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the disease. The remarkable and elaborate experiments of Blackley, from 1866 to 1878, conclusively prove that a most important exciting cause of hay-fever is found in the action of pollen upon the mucous membrane of the nasal cavities. In his own person he showed that the inhalation of pollen always brought on the symptoms of hay-fever; that there was a direct relation between the intensity of the symptoms and the amount of pollen in the air, and that none of the other agents referred to, such as heat, light, ozone, dust, or odors, would, of themselves, cause the distress. His range of observation included the pollens of various grasses and of cereals and of plants of thirty-five other natural orders. His experiments were made in the hay-fever season in England, between the end of May and the latter part of July, and showed

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that ninety-five per cent. of the pollen contained in the atmosphere belonged to the *Graminaceæ*. The apparatus from which he obtained the most satisfactory results in his investigations consisted of a vertical plate of glass,  $\frac{7}{8}$  of an inch in diameter. It was covered with a hood, and was pivoted to an upright staff. A weather-vane surmounted the hood to control the face of the glass-plate before the wind. Upon this glass-plate was affixt a microscopic cover-glass, one centimeter in diameter, covered with glycerin. Any pollen floating in the atmosphere would thus be carried upon the plate by the wind-current and adhere to the glycerin upon the glass-slide. Blackley thus found that the amount of pollen caught upon the plate increased progressively from the seventh to the thirtieth of May, when twenty-five grains were counted, to seventy-six grains on the

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eighth of June, and to 280 grains on the tenth of June. On the twenty-eighth of June 880 grains were counted, after which date they decreased until the first of August, when they had completely disappeared. Bright, sunny days brought large quantities of pollen, while rainy days decreased the amount. Passing showers ameliorated the individual symptoms, tho not affecting the amount of pollen deposited upon the slide. Blackley also clearly showed that the mucous membranes of the nasal fossæ were not affected by pollen in the atmosphere when twenty-five grains per diem only were deposited on his glass, while seventy-five grains in twenty-four hours would irritate in certain individuals. When 280 grains of pollen per day were deposited the direct action upon the mucous membrane of this quantity would result in complete vascular dilation.

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Clinical observation has shown a parallel, but by no means a complete, analogy to the above phenomena in the action of cocaine in different strengths of solution.

Emanations from the rose and from rye have been shown to have caused coryza, occlusion of the nostrils, and sneezing for from six to eight hours. The sweet-scented vernal grass (*Anthoxanthum odoratum*), sweet-scented soft grass (*Holcus odoratus*), meadow grass, meadow fox-tail, Indian corn, barley, wheat, oats, bean-flowers, lilies, elder trees in bloom, the goldenrod, hay, timothy, and clover, and others may be mentioned. In America the pollen of the Roman wormwood, ragweed, or hogweed (*Ambrosia artemisiæfolia*), is the most commonly referred to. It is very common in nearly all the States. It blossoms in August and September, the prevalent time of hay-fever. Wyman and

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his son, who had fled to the White Mountains to avoid hay-fever, were immediately attacked when a package of the ragweed was opened there. The seashore, usually exempt, sometimes is not so, probably due to the presence there of the pollen of the *Artemisia gallica*, another kind of wormwood. In England the *Anthoxanthum odoratum*, or "sweet-scented vernal grass," seems especially causative. There must also be mentioned the common daisy (*Bellis perennis*) of England; also the rye-grass (*Lolium perenne*) and "sweet-scented soft grass" (*Holcus odoratus*). In Germany the rye-blossom is chiefly indicated as a cause. In Australia the Cape weed pollen is regarded as most commonly provocative. It covers the hills round about Adelaide to the height of some thousand feet or so. Most of the population of Adelaide is affected with

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hay-fever during the time of its blossoming, viz., in September. In India, where the malady occurs chiefly in February, it is the blossoms of the mango-tree (*Mangifera indica*) that are held responsible.

J. C. Wilson holds that most subjects are not sensitive to emanations from hay, and points out that there are no distinctive bacteria to give rise to the affection. Marsh, himself a sufferer, stated his belief in the pollen theory, conceiving hay-fever analogous to *Rhus toxicodendron*, or ivy-poisoning of the skin.

There are two authentic cases which would impair the pollen theory, the well-known exemption of hay-fever subjects at sea being granted. One is mentioned by Walshe, in which a passenger retained his symptoms of hay-fever during a passage across the Atlantic. Abbotts Smith has reported the other, in which the disease came

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on at sea nine miles from land. In this latter case, unfurling the sails in which a large quantity of pollen had been folded may explain the occurrence. In the former instance the diagnosis was by no means certain and the presence of some other irritant may have accounted for the distress. Moreover, it is by no means impossible for pollen to be deposited on a ship even when miles away from land. In speaking of the distribution of pollen Darwin tells of how the ground near St. Louis, in Missouri, has been so widely covered with pollen that it looked as if it had been sprinkled with sulfur. Pine forests, 400 miles south, were probably the place and distance from which it came. On March 16, 1883, in Philadelphia, ignorant people took for brimstone a shower of yellow pollen which had been blown from some distant pine forest.

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After citing many of the various causative pollens Holmes says that he is "not aware that any specialized action has been proved; all act (if at all) by mechanical irritation." He also shows the punctuality of flowering on the selfsame date yearly is an absurdity, depending, as the flowers do, upon the variations of the seasons.

The date of the flowering of plants varies within certain limits, and he points out the mutability of the blossoming date, or, more rationally, its limited variation, and further adds that "even as a mere irritant, as pollen affects comparatively few, it must act upon a condition which is pre-existent, which is, therefore, independent of and predominates it, else would the cause, pollen, produce it universally."

As already mentioned, it has been claimed, that a toxin generated from pol-

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len by a fermentative process in an alkaline solution is the cause of hay-fever.

### 2. THE PREDISPOSING CAUSES

While millions of people are exposed to the exciting causes of hay-fever, comparatively few suffer from it, and that there is an underlying condition, predisposition, or idiosyncrasy, can hardly be doubted. Exactly what this is, or on what it depends, is unknown. Abbotts Smith, as early as 1865, spoke of a predisposition to attacks of hay-fever as one of the principal causes thereof. As Holmes has shown, there must be individual predisposition, since the exciting causes, if pollens, are everywhere. This predisposition or idiosyncrasy has generally suddenly developed without apparent reason. It has been argued that it is systematic or central, and that it is due to some local abnormality of the mucous

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membrane, the capillaries, or the periphery of nerves. Once acquired, however, it is seldom lost, and it apparently increases with each successive year.

The influence of race is seen in the fact that the English-speaking people are the principal sufferers. In India, Africa, and Australia it is mostly the English and Americans who are attacked. In America it occurs in nearly every State, altho much more infrequently in the South. In Canada hay-fever is rare, especially in the maritime provinces. Wyman relates a case—the only one reported—of hay-fever in an Indian child. Beard mentions that Dr. Jacobi, of New York, who practised much among the Germans, had never met with a case in that nationality; and in the same city a similar observation was recorded by Dr. Chaveau, a practitioner among the French. Sajous has called at-

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tention to a curious fact in this connection—viz., that the principal sufferers, American and English, are excessive tea-drinking nations, and that this beverage may exert a depressing influence on nerve-centers. It would be interesting to have some information as to the existence of hay-fever in China and Japan, the tea-producing countries. John N. Mackenzie, in 1884, gives the first recorded instance of hay-fever in a negro, a male of thirty-five, tall, well-proportioned, and respectable, the attack lasting from the second week in August to late in September. A sensitive spot was found on the left inferior turbinate bone,  $1\frac{1}{4}$  inches within the nostril, which gave origin to a most intense paroxysm of asthma on simple contact with the probe.

Reports of hay-fever have come from nearly every quarter of the civilized globe.

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It is seldom seen in the far North, and is more frequent in the temperate than in the torrid zone. It is seen more often in urban than in rural districts. The disease is by far the most frequent in Great Britain and the United States. In Norway, Sweden, and Denmark it is seldom found, and it is scarcely ever seen among the natives of Russia, Germany, France, Italy, or Spain. The English and Americans in India and Africa are the only ones who are affected by it. Macdonald, in 1893, said the Irish are certainly not exempt. In the north of Scotland it is very infrequent, while in the south of England the disease is more frequently found than in the north. In Australia and New Zealand it is occasionally found. Literature is strangely silent about South America, but this land is strange to us in many other ways. Pirrie gives an instance of an English officer in India suf-

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fering there when vegetation was altogether different from the forms met with in England where his attacks had begun. As already noted, the complaint has made its appearance in two instances when its victims were at sea; one, reported by Abbotts Smith, after shaking out the sails when nine miles out at sea; and another, reported by Walshe, in which the patient suffered throughout a voyage across the Atlantic. A "sufferer" records that numerous portions of England, especially the highlands and the seacoast, and nearly all of Wales and Scotland are exempt from the disease. He also regards the upper side of the St. Lawrence River, most of the province of Ontario north of the Welland Canal to the Detroit River similarly exempt, and he states that the disease is wholly unknown to regions above the outlet to Lake Huron.

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Wyman has considered the regions of America where hay-fever is especially prevalent. That portion of country east of the Mississippi River and lying between the 35th and 45th parallels of latitude he regarded as the territory of prevalence. Canada and the Adirondack Mountains, the Appalachian range, and the elevated plateau throughout New York State he considered almost exempt from hay-fever. That portion of the United States west of the Mississippi River he seemed to think, as did Beard also in his later investigations, was free from the disease. Beard based his reasons upon the lack of vegetation and the sparseness of the population. Bosworth regards as better reasons the rugged mode of life of the inhabitants and the consequent vigorous health of the frontier life. It is a curious observation, too, that certain portions of the White Moun-

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tains country, formerly regarded as invariably free from hay-fever, of late years, probably owing to the extension of civilization and its vegetation to these regions, are no longer exempt from it. Southern climates, to a certain extent, are exempt from the disease. Wyman thought it did not prevail south of the 35th parallel of latitude, with the exception of certain districts in the neighborhood of Milledgeville, Georgia, Montgomery, Alabama, and Beaufort, North Carolina. There can be little doubt that the affection is less common in Maryland, Virginia, in the border States, and in the far West; that it is rare in the extreme South and on the Pacific slope. The zone between the 35th and 45th parallels of latitude practically includes the hay-fever district. Even in this section, localities, from their proximities to large bodies of water or to oceans, to

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elevation or to absence of certain vegetation, afford immunity. A "sufferer" states that on Lake Michigan hay-fever is absent above Ludington, while on the Mississippi, in Wisconsin, it is present as far north as the Chippewa River, and in some seasons, in a mild form, it is seen in St. Paul, Minnesota. It is known to extend to the latitude of Memphis in the West, Knoxville centrally, and Cape Henry on the Atlantic. In 1896 W. W. Bulette stated that in certain sections of Colorado there is a variety of the affection known among laymen as blossom or cotton-wood fever, and very prevalent in regions where the cotton-wood tree abounds. The symptoms are practically identical with those of the autumnal variety of hay-fever, except that the throat and bronchial irritations are intensified, and the course of the attack is somewhat shorter. Symptoms occur about

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the 12th of April and terminate in the latter part of May, and rarely last longer than July 1st.

Beard's pamphlet was the first to show a radical departure from the pollen theory and to establish that the neurotic habit was an essential factor. He showed that subjects of hay-fever often acquired the affection or the tendency to it through inheritance. The facts sustaining this view are of "a most overwhelming character." Wyman, himself a sufferer, records numerous cases in his own family through four generations. He proved the powerful influence of heredity in many of his cases. It even appears in childhood, he states, and quite generally in those of nervous diathesis. In Dr. Morell's family there were six sufferers from hay-fever besides himself. In the family of Henry Ward Beecher there were two besides himself;

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and Chief Justice Shaw's family contained seven. Bosworth says that eighteen of eighty cases disclosed direct heredity, while in thirty-nine there was either hay-fever or asthma in the family. Of the forty cases of Sajous', thirty-five per cent. had near relatives who presented clear histories of hay-fever, and forty-two per cent. had asthmatic relatives, while fifty-three per cent. of these cases presented a family history of either hay-fever or asthma. Morell Mackenzie has several times treated father and children for hay-fever at the same time. Prince relates that five members of the same family were hay-fever subjects. One daughter of thirty years suffered with June cold ever since she was five years of age, every year save 1887, 1888, and 1889. Her grandmother, mother, and two brothers suffered alike. The daughter, convinced that mental or

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nervous influence affected her, in 1887 was treated by the "mind cure," and for three years subsequently was free from her symptoms. When the original mind curist was dead, in the fourth year, the symptoms returned as badly as ever. Christian Science influence was tried in vain.

There can be little doubt that males are more afflicted than females. Of the early forms of the disease, however, females seem more susceptible than males. Of 433 cases cited by Phœbus, Wyman, and Beard, only 142, about one-third, were females. Of 506 cases gathered from several authors, 342 were males, 164 females. Morell Mackenzie met with 38 cases in males and 23 in females. Men are the more exposed to the exciting causes such as dust, heat, pollen, etc., altho females are the more neurotic. The proportion is about one female to three males.

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Only to some extent can age be said to affect the disorder. The liability to hay-fever in the great majority of cases appears before the age of forty. The malady has been reported, however, as occurring for the first time in persons as old as sixty, and persons of seventy and upward have suffered. Of the cases of children who have been attacked the disease had manifested itself in the parents. It would have probably been regarded as a common cold, had not the parents been the subjects of the affection.

Most all writers on this subject have observed that the disease attacks the better educated classes and those of fair social position. It is rarely met with among the laboring classes. This would seem to emphasize the view that the disease is essentially a neurosis. From the notes of sixty-one cases of hay-fever in private practise,

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and the sight of many others of which no record was kept, Morell Mackenzie found all the patients persons of some education, and recalled having seen none among his hospital patients. Of forty-eight cases of Blackley, all were educated, and Wyman made the same observation. Holmes has shown that the ignorant classes are not so likely to recognize the disease as a distinct affection, and apply for medical aid.

The fact that the rustic is much less subject to this disease than the dweller in the city and town, shows the influence of the mode of life. Farmers and agriculturists, exposed, it would seem, far more to the exciting causes than others, are peculiarly less liable to suffer from it. Beard reports only seven such cases among 200. Morell Mackenzie states that it is impossible to tell whether the villager owes his exemption to the maintenance of vigorous health

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by an outdoor life, or to habitual exposure to the cause of the complaint.

Holmes admirably points out that "a part of the mysterious origin must be set down to the indifference of the sufferers who, from year to year, have forgotten their periodical affection and failed to consult physicians." He says: "Of similar cause is the groundwork of the assertion that it affects only the wealthy. This is simply because with this class there is a higher intelligence and closer attention to ailments, and the fact that having once discerned the actual condition, they, in many instances, take professional advice or go to a place of refuge, thus drawing notice to themselves, all of which things are denied to the lower (poorer) classes. It is said that there are some 200,000 sufferers in the United States, at least within the range of observation of the Hay-Fever Association,

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which, meeting annually at Bethlehem, N. H., may be held to represent the more stable and well-to-do. From my own experience and observation I am convinced that there are many of our working people who suffer from this affection who do not even recognize the disease." Merchants, professional men, persons of sedentary habits and brain-workers supply most of the victims. The disease is not so uncommon among hospital outpatients here and in England as formerly.

Concerning the influence of the neurotic tendency, Beard pointed out, in 1876, two popular misconceptions of the nervous theory, first, that nervous susceptibility implies debility and emaciation, whereas the nervous temperament is consistent with great strength and power of endurance, especially when combined with the bilious and sanguine temperaments; and,

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second, that the nervous theory dispenses entirely with the influence of exciting causes, as heat, pollen, etc. Beard concluded that the disease is a complex resultant of a nervous system especially sensitive in this direction and acted upon by the enervating influence of heat and by any one or several of a large number of vegetable and other irritants, and this view has the advantage over other theories in that it accounts for all the phenomena exhibited by the disease in this or in any other country. He believed that the transmissibility of the disease from parents to children; the temperaments of the subjects; the capricious interchange of the early, the middle, and the later forms; the periodicity and persistence of the attacks and their paroxysmal character; the points of resemblance between the symptoms and those of ordinary asthma; the strange

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idiosyncrasies of different individuals in relation to the different irritants; the fact that it is a modern disease peculiar to civilization; the fact that it most abounds where functional nervous disorders are most frequent and is apparently on the increase *pari passu* with other nervous diseases; and, finally, the fact that it is best relieved by those remedies which act on the nervous system,—all these otherwise opposing and inconsistent phenomena are by this hypothesis fully harmonized. Prince remarks that altho a nervous origin has been recognized by some, still no theory has been proposed to show the connection between the physical symptoms and the nervous processes nor the pathology of the nervous processes themselves.

Vasomotor susceptibility has been viewed as indicating the neurotic tendency, and this may or may not be due to a central

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lesion. John N. Mackenzie regarded disordered functional activity of the nerve-centers as the expression of the nervous origin. Again, a general neurosis disposing to vasomotor disturbance of the sympathetic and the trigeminus nerves has been held responsible. Kinnear speaks of two forms,—one a hyperemia, and the other an anemia of the sympathetic ganglion. Bosworth is inclined to think a peculiar lack of vasomotor control characterizes the neurotic manifestations. In asthma there is undoubtedly vasomotor paroxysm of the blood-vessels of the bronchial mucous membranes, while in hay-fever it is of the nasal mucous membranes.

Solis-Cohen regards hay-fever as generally a neurosis, primarily a vasomotor ataxia or idiosyncrasy. Another view is that it may be due to an organic alteration of the nerve-fibers terminating in the nasal

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region and chiefly in three reflex areas. Again, that it may be due to functional activity or paresis of the governing (vasomotor) centers, accompanied by hyperexcitability of the erectile (cavernous) tissues aroused by peripheral irritation. The phenomena of the cavernous nasal tissue, tho secondary to the centric condition, indicates a vasomotor disease. Hack and Robinson believe the morbid lesion is one of neurotic disposition with hyperesthetic condition of the olfactory and fifth pair of cranial nerves.

Analogous to the neurotic habit is idiosyncasy. Apparently the same understanding as to what an idiosyncasy is has underlain the use of this word by various writers who have advanced idiosyncrasy as a cause of hay-fever. Morell Mackenzie, in 1880, put it down as a predisposing cause, but does not say upon what the idiosyn-

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crasy depends, whether upon some local abnormality, the capillaries, the nerve-centers, or the periphery of the nerves.

In 1897 S. Solis-Cohen said idiosynerasy is a real condition in hay-fever, and cited the idiosyncrasies to salicylic acid, quinin, ipecac, opium, etc., as similar to idiosyncrasies that patients exhibit toward the different irritants capable of producing hay-fever. Using the word to express the fact that certain persons react differently from most of mankind to certain forms of irritation, it means something. It means that such persons are abnormal, altho the cause of the abnormality remains to be discerned. Holmes, speaking of idiosyncrasy, would not say there is no such thing as idiosyncrasy, but as far as hay-fever went, he held that the disease was an actual one, the nature of which was not yet comprehended. He remarks that it is quite

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probable that uric acid would aggravate hay-fever as it would any other condition in the body; and that some think to have proved this by the use of salicylic acid, to which drug many persons have an idiosyncrasy, thereby aggravating the condition in hay-fever by the elimination of uric acid.

Dr. Samuel Ashurst, in 1897, recorded his habit of regarding hay-fever of late years as a personal idiosyncrasy acted upon by some irritant, and observed that without this personal element it is difficult to account altogether for the symptoms and their peculiar periodicity.

In 1882, Daly advanced the theory of the local disease as causative of hay-fever, and reported a case in which the patient recovered after the removal of a nasal polyp, which by continuous mechanical irritation had doubtless given rise to the condition underlying. Examinations of the nares of

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hay-fever patients have repeatedly failed to show any local disturbance other than general congestions. Daly's theory was subsequently accepted and supported by Hack and Roe, who both affirmed that the influence of a morbid condition of the nasal mucous membranes favored the development of hay-fever. In 1883 Sajous and Herzog wrote important papers to prove the same facts. In 1884 J. N. Mackenzie demonstrated that "there exists in the nose a well-defined sensitive area whose stimulation through a local pathologic process, or through an extra irritation, is capable of producing an excitation which finds its expression in a reflex act or in a series of reflected phenomena." He located this area at the posterior end of the inferior turbinated bones and corresponding portion of the septum. It has since been held by advocates of the local

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theory, that diseases and abnormalities of the nose, such as a markedly deviated septum, outgrowths from the septum, hypertrophic rhinitis, enlargement of the inferior or middle turbinated bodies, mucous polypi, and marked turgescence of cavernous tissue on the inferior turbinated body, were all provocative of hay-fever paroxysms.

In 1884, Harrison Allen declared that the primary lesion was one of obstruction, temporary or permanent, in one or both nostrils, from one of various causes, attended by vascular dilatation. Bosworth likewise held that the existing morbid condition of the intranasal tissues must be one of an obstructive character, tending to produce in itself vascular dilatation. Regarding nasal polypi, occasionally considered as active causes of hay-fever, Bosworth concludes that they are rather a result

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than a cause, since the great quantity of outpoured serum makes the nasal mucous membrane sodden or water-soaked, and in this way myxomatous degeneration develops, eventually assuming the form of polypi.

J. N. Mackenzie, however, examined the nares of many sufferers from hay-fever without finding any nasal lesion. Holmes noted an instance most carefully reported, in which, with cold snare and galvanocautery, all obstructions were removed, and areas rendered anesthetic so that a probe no longer excited reflex symptoms, yet the patient suffered from hay-fever with scarcely diminished intensity. He further observes that at least a degree of the condition might be the result and not the cause, the peripheral susceptibility being an outward expression of an inward state.

In 1885, Thornwaldt, in Wiesbaden, in

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his observations on nasal catarrh, assumed that nasopharyngeal disease might not only give rise to symptoms simulating nasal disease, but was likely the actively predisposing cause of asthma and hay-fever. Bosworth agreed with him as far as hay-fever is concerned.

In 1893 Seth S. Bishop announced to the American Medical Association that "an excess of uric acid in the blood causes hay-fever, or nervous catarrh." Uric acid in the blood in marked excess of the normal relation to urea, of about one to thirty-three, causes certain disturbances of a vascular and neurotic character. In health, five to eight grains of uric acid are secreted every twenty-four hours. Haig claimed that an effect of an excess of uric acid is contraction of the arterioles and capillaries all over the body. He found that by diminishing the alkalinity of the

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blood it was freed from uric acid, the arterioles were relaxed, and the headaches and mental depression were relieved. Cerebral anemia has appeared to obtain in hay-fever, and the attacks were relieved, Haig found, by such remedies as relieved anemia of the brain, *e.g.*, amyl nitrite, coffee, and other cerebral stimulants. These views of Haig were concurred in by Thomas J. Mays, Murchison, Conklin, Ebstein, Quinquaud, and others. Bishop, in 1894, remarked that the blood in the morning is more alkaline than at any other time of the day, being, at about nine o'clock, at its greatest point of alkalinity, which would seem to account for those attacks of hay-fever which came on early in the morning, and which in some instances were ascribed to the influence of light. He was of the opinion that not only an excess of uric acid in the system, but also an increased

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formation thereof should be regarded in the treatment of hay-fever. Bishop also claimed that the uric-acid theory was not antagonistic to the essentially neurotic character of the disease. He also advanced that the primary determining cause of the particular manifestations in this disease is an inherent, perhaps hereditary, susceptibility of the nervous system. In this way only can we account for the fact that the same subjective or objective exciting cause (uric acid or pollen) will produce one train of distressing symptoms (nervous coryza) in one individual, and an entirely different one in another (asthma). This uric-acid hypothesis explains why some persons suffer from attacks under certain conditions in winter as well as during the warm months. It also unifies all the forms.

Bishop says: "The uric-acid theory of

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hay-fever is not antagonistic to the present status of medical opinion or surgical treatment, but, on the contrary, it explains questions that were inexplicable before. As a tumor or hypertrophied bone may give rise to convulsive seizures in epilepsy, and as its removal may be followed by relief when no other structural cause exists, so in hay-fever, when new growths and other lesions of the nasal mucous membrane are present, the attack may be started by the accumulation and the sudden setting free of uric acid. This precipitates the paroxysm by its irritant action, which finds expression in the group of symptoms characteristic of hay-fever or asthma, instead of some one of the other allied diseases. The particular form of manifestation may be determined by the growth or the seat of irritation located in the nasal cavities. When this is the only de-

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termining factor of the nature of the morbid symptoms, no other disease having resulted from the long-standing trouble, the removal of such a peripheral source of irritation may give relief from these symptoms, but it may not prevent the uricacidemia from switching off into other kindred lines of disturbances, if it be not corrected."

Capp, in advancing a new theory, inclines to the uric-acid theory, and alludes to a certain spastic condition not mentioned by other writers, which, altho slight in character, is general, rather than confined to limited areas, and in a large measure accounts for many manifestations of the disease. A central nervous irritation is probably caused by the presence of a disturbing element in the blood, presumably products of imperfect metabolism not eliminated. This may originate nerve-cur-

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rents with innumerable reflexes, which, in the disturbed equilibrium of the system, are, in a measure, uncontrolled by the ordinary inhibition.

Holmes has very cleverly pointed out a fallacy in regard to the evidence advanced to substantiate the uric-acid theory. He states that some investigators by the use of salicylic acid and various acids to diminish the alkalinity of the blood, thus eliminating uric acid, have, thereby, actually aggravated the condition in hay-fever, which aggravation has been thought due to excess of uric acid in the tissues, or increase in its production, instead of being due to the idiosyncrasy to salicylic acid, etc.

In 1897, Grayson stated that even if we grant that a certain number of hay-fever patients are unquestionably people of a neurotic temperament, while others are

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gouty, can not we profitably look beneath these titles and recognize the fact that they are dyscrasies, which are merely different offshoots from a parent weed that is rooted in defective nutrition? By defective nutrition is meant all the phenomena of metabolism,—constructive, destructive, and eliminative. Disturbance of one means disturbance of all. With continued absorption of toxic materials from the intestinal tube, or with persistent incomplete elimination of the products of suboxidation, it is only a question of time when autotoxemia will provide us with any of the functional neuroses from hay-fever and asthma to chorea and epilepsy.

Grayson says the neurotic habit may exist, but it is not essential to the disease, but the nervous system is implicated as a victim, not as a culprit. He claims that hay-fever is a defect, not of the nervous, but of

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the nutritive system, because impairment of the digestive and nutritive processes is almost invariably the first downward step toward a general state of lowered vitality. At first gastric, it later involves the whole gastro-intestinal tract. He thinks uric acid is almost invariably present in excess in hay-fever subjects. A child having reflex convulsions due to acute indigestion is not a neurotic subject, yet the vasomotor perturbation of the hay-fever patient differs from that of the child mainly in point of chronicity.

Grayson concludes that the three factors which make up the etiologic combination of hay-fever are: An external irritant, some intranasal abnormality, and a constitutional element—"defective nutrition." The physician unaided can not restore the nose to a state of health. In order to overcome the self-indulgence of the patient,

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regularity is recommended in eating, work, and play, while indiscretions of diet, lack of exercise, objectionable fancies in matters of clothing and bathing, and, finally, vicious excesses—alcoholic, narcotic, or sexual—will require the constant and most determined effort of the patient himself. The whole environment of the patient must be separately studied and provided for in the dietary scheme. A comment on this treatment is: “While it is true that if a man takes care of his muscles his nerves will take care of themselves, there is no closing of the eyes to the fact that to the average man exercise is distasteful; therefore, it is the more necessary to be explicit in instructions concerning it. Altho there is nothing brilliant about this method of removing the constitutional factor of the disease, what it lacks in brilliancy is more than made up in certainty, and if the

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patient is possesst of grit and determination it brings a sure reward."

J. Müller thinks there is a causal relation between hay-fever and gastro-intestinal symptoms, but he also holds that it can be proved that pollen entering the respiratory tract is the cause of the disease. A "sufferer," writing on the disease, says: "Indigestion is a most potent cause in many instances, and proper food, properly digested and assimilated, has permanently relieved more than one." But he does not say he himself was relieved, nor does he give cases.

It is questionable whether or not the digestive disturbances are not effects rather than causes of the disease. It is not at all doubtful, however, that lowered resistance and a depreciated vitality may result from difficulty in the gastro-intestinal tract. Such difficulty may suffice to start the chain of hay-fever symptoms.



*PART III*  
**FORMS OF TREATMENT**



*PART III*  
**FORMS OF TREATMENT**

**1. PREVENTIVE MEASURES**

In the young we find preventive treatment giving the greatest rewards. This calls for careful attention to the general health of the growing child. The medical profession has done much to awaken an interest in preventive measures among parents, and in no way has the family physician reduced infection more thoroughly than by insisting on a careful toilet of the nose and throat. In this way he has very frequently prevented many of the more serious diseases of the growing child. Personal hygiene is as valuable as domiciliary hygiene, yet, if either is neglected disease is certain to continue.

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The careful parent will insist upon frequent professional examinations of their children and at the first sign of discomfort have any abnormal condition corrected. It is not wise to wait until distress compels relief, and if hay-fever is an inheritance in a family it is especially important. Children with enlarged tonsils and adenoids should have them removed not only to increase their mental poise but to secure their physical comfort, and also as a step in escaping hay-fever. Adenoids are frequently the cause of broken rest at night, with earache, a tendency to repeated bronchitis; this is seen more frequently during spring and fall. This condition may bring on change in voice and oftentimes a running nose. With enlarged tonsils we frequently encounter the unproductive cough. We may mention, while passing, that enlarged tonsils remaining after the tenth year

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should be removed, as they are undoubtedly hopelessly diseased. I am a firm believer that tonsils and adenoids should be removed early, for, in addition to this local discomfort they influence the mental health by rendering possible a more systemic depreciation of the child. The frontal sinus may become involved as well as the ethmoid. Young children are frequently found to suffer with deviated septum and this contributes to the general discomfort. With the pressure of retained secretion polypi are not unusual.

Ballinger has been imprest with the possible relationship of catarrhal sinusitis, particularly ethmoidal and frontal, to hay-fever. He has found surgical treatment of the sinusitis to be followed by relief of the hay-fever. The difficulty in the way of diagnosticating catarrhal sinusitis has been so great that it has been frequently un-

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recognized. Hay-fever due to catarrhal sinusitis has been cured by Dr. P. M. Farrington, of Memphis, by the use of auto-genous vaccine.

Dr. Ballinger quotes the late Dr. Schadle, who called attention to the possibility of relationship between maxillary sinusitis and hay-fever. Whether or not such a relation exists, we must recognize the fact that the local hyperesthesia probably has an anatomical or inflammatory origin. The hypersensitiveness does not "happen" but has a definite cause. The hypothesis is still further supported by clinical facts—that some cases of hay-fever are cured by successful treatment of the sinusitis. Heredity may impress a neurotic temperament on the growing child with tendency to gout or rheumatism. This unstable condition of the nervous system is difficult to define, there may be an excess or decrease in the

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nervous energy. There may be a faulty metabolism whereby certain toxic substances are liberated in the blood current. That hay-fever subjects are usually neurotic has been generally accepted. Why they are neurotic is a much mooted question, concerning which ingenious theories have been advanced, but none of which are convincing.

Preventive treatment for hay-fever, therefore, must take in family history and family tendency in an endeavor to correct local, as well as constitutional faults. This intimate knowledge of family history gives the physician the insight to the constitution of the child. Heredity may do much to balance or unbalance nervous energy, it may do more to handicap a child physically, but I am of the opinion that environment plays a most important rôle in the growing child. In childhood preventive

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measures yield the best returns, and this is well illustrated in the development of hay-fever tendency, and it is wise that the masses have grown active to the needs of the young.

As an important feature in preventive measures I can do no better than quote here the article of Dr. Scheppegrrell, the president of the American Hay-Fever Prevention Association, on "Hay-fever; Its Cause and Prevention."<sup>1</sup>

"From the standpoint of the number of patients affected, hay-fever ranks among the first of the non-fatal diseases. While accurate statistics regarding the number of patients are not available, a conservative estimate has placed the number of persons in New Orleans affected with hay-fever at not less than 3,500, or one per

<sup>1</sup> Published in the Journal of the American Medical Association for March 4, 1916.

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cent. of the total population. Hay-fever is prevalent in the greater portion of the United States, and the proportion in New Orleans is a fair average of its prevalence in other sections. The total number of those suffering from this disease, therefore, is so large that the subject demands the most careful consideration.

"In spite of the greater increase in medical knowledge, many cases of hay-fever are still mistaken for ordinary colds. The symptoms described and their recurrence at certain periods of the year should simplify the diagnosis. In doubtful cases, this may be confirmed by testing the patient with a small amount of pollen.

"Some of the staminate flowers of the suspected plant are placed in a small sterile gauze-bag, and this gently sniffed by the patient. In susceptible subjects this is quickly followed by a slight reaction. The

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patient may also be tested by approaching the suspected weeds so that some of the pollen is inhaled in this way.

"In the majority of cases, however, these tests are unnecessary and should ordinarily be avoided on account of the danger of developing a latent pollinosis. The beginning and end of the attacks are usually found to be coincident with the pollinating period of certain plants with wind-borne pollen, which, with the symptoms described above, is sufficient to confirm the diagnosis.

"Some physicians still believe that hay-fever is a local manifestation of some constitutional condition, in spite of the fact that the majority of patients, with similar conditions, have no such manifestations, and that when the pollen is not present, as on a sea trip, they do not occur. Improved education in the etiology of this disease,

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and more careful observation, will gradually correct this error.

"Even had therapeutic measures been more successful, prophylaxis, based on the removal of the exciting cause, should have been advocated as in malarial and typhoid fevers, tuberculosis and other diseases of known cause. Hay-fever, however, has been the step-child of preventive medicine, and until recently no organized efforts in this direction have been undertaken.

"In view of the great and increasing number of hay-fever patients, their prolonged distress, the unsuccessful results of all curative measures and the distinctive preventable character of the disease, the American Hay-Fever Prevention Association has undertaken a campaign of education, to be followed in due time by suitable legislation, for the prevention of hay-fever.

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"In the educational part of this work, the first consideration is the correct diagnosis of hay-fever and the acceptance of the fact that all cases of true hay-fever are the results of pollen inhalation.

"The identification of the various weeds and plants that may develop hay-fever is of the utmost importance, but will gradually follow the establishing of the etiology of pollinosis. As these principles become better understood, the physician, when consulted by a patient with hay-fever, instead of limiting his attention to writing a prescription or injecting a vaccine, will investigate the presence of hay-fever-producing weeds in the neighborhood of the patient's residence or vocation. In many cases the eradication or even the cutting of such weeds produces immediate results.

"In one of my patients, the offending

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weed, *Ambrosia artemisiæfolia* [rag-weed] was growing in his garden. In another, a school-teacher, affected with hay-fever for many years, on being questioned stated that there was an abundance of flowering weeds in the vacant lots adjoining her house. When specimens of these weeds were produced they were found to be the *Parthenium hysterophorus*, one of the causes of hay-fever in South Louisiana. In both of these cases marked relief soon followed the cutting of these weeds. In order to obtain complete relief in such cases, however, the cutting of the weeds should be over a considerable adjoining area, as the pollen is wind-borne to a distance depending on the velocity of the wind.

"While the removal of the offending weed is the correct measure, relief may also be obtained, when this is impractica-

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ble, by avoiding the proximity of weeds known to be toxic to the patients. In many cases this is entirely practicable, as shown in the following case in which the attack was postponed for thirty-three days:

"E. G., manager of a sugar plantation near New Orleans, has been a sufferer from hay-fever for the past ten years, the attacks always commencing about August 25th. After the influence of the ragweed to this form of hay-fever had been explained to him, he concluded that his attacks were due to the pollen of the trifida ragweed which grows on a road some distance from his residence. He, therefore, avoided the road, and until September 28th, for the first time in ten years, he had had no attack. On this date he found it necessary to pass this road. In twenty minutes he commenced to sneeze, that night he had a violent attack, and the fol-

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lowing day he had his usual annual hay-fever.

"The treatment of cases by the eradication of the hay-fever-producing weeds will not only produce direct results, but will also prove a powerful impetus in educating the public in the relationship of such weeds to hay-fever. It will result, moreover, in having these weeds considered from a new point of view. Instead of simply indicating neglect or careless cultivation, they will be looked on as a source of disease and discomfort to a large class of sufferers. This will not only bring the leverage of public opinion to the eradication of these weeds, but will eventually simplify the question of legislation.

"In connection with the question of public education, the American Hay-Fever Prevention Association has received a communication from Dr. Rupert Blue, sur-

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geon-general of the United States Public Health Service, and one of the honorary vice-presidents of our association, in which he summarizes this in a very concise manner:

"It appears that the most practical method of securing the cooperation of the public would be by education as to the effect of the presence of these weeds in communities from both health and economic standpoints. This seems to be the primary object of your association, which is to be commended for its efforts."

"Some of the early forms of hay-fever are due to the pollen of the *Graminaceæ* or grasses, which include the cultivated varieties, such as rye, wheat, corn, etc. These form a common cause of hay-fever in England and the Continent, where the autumnal form due to the ragweed is not found, owing to the absence of the weed.

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"While this is of much less frequency than the fall hay-fever in the United States, it represents in the aggregate a considerable number. When these cases are due to the cultivated varieties, the knowledge of this fact should induce the patient, whenever possible, to live away from such cultivated fields or at least to avoid them during the active season of pollination. Only in those cases in which the removal of the offending plant is impossible will the question of treatment be given preference over prevention.

"As the autumnal hay-fever is the most prevalent form in the United States, and, in the majority of cases, is due to ragweed, the American Hay-Fever Prevention Association has given its first attention to the eradication of this weed. The description and illustration of both varieties (*Ambrosia artemisiæfolia* and *trifida*)

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have been sent to the State boards of health of each State and of the District of Columbia. Many of these have published the cuts and descriptions, and a number have sent them to the newspapers of their State for publication.

"The United States Department of Agriculture has assisted and is furnishing valuable information for this work. Arrangements have been made with the Hygienic Laboratory of the Public Health Service at Washington to make investigations on the hay-fever pollens submitted by our research department. Encouragement or promise of active cooperation has been offered by the majority of the State boards of health, these being as follows: Arkansas, Alabama, Arizona, California, Colorado, Delaware, Florida, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Ne-

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vada, New Hampshire, New Jersey, New York, North Carolina, Oregon, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

"The common ragweed (*Ambrosia artemisiæfolia*), while found in great abundance, presents no special difficulty in eradication, as it is an annual and reproduced only by seed. In carefully cultivated lands it is not found in appreciable quantities. Where the land is not cultivated this weed may be entirely kept down by grazing cattle. When, however, it has been neglected, the weed should be mowed before the latter part of August, in order to prevent pollination.

"The giant ragweed (*Ambrosia tripida*), which grows in similar abundance in the moist lands of the coast, presents a more difficult problem, as the roots are perennial. Until this weed is two feet in height

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cattle will feed on it with avidity, which will probably prove useful in destroying it. In carefully cultivated lands it is rarely found. The question of the best scientific method of eradication of both the rag-weeds has been referred to the United States Department of Agriculture, and the results of this investigation will be reported later.

"With a view of showing what can be accomplished by organized efforts in the prevention of hay-fever, the American Hay-Fever Prevention Association has concentrated its first efforts in New Orleans in the following manner:

"The public was first educated regarding the ragweeds, so that they could be easily recognized. Illustrations of the weeds were published in the Bulletin of the State Medical Board of Health and the public press, and the live weeds, in full de-



SEASIDE GOLDENROD



GOLDENROD, ROUGH STEMMED



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velopment, were exhibited in a show-window of the principal street.

"The city of New Orleans, through the commissioner of public works, placed at the disposal of the association twenty convicts, who cleared the streets and sidewalks of the outer sections of the city of the weeds, in accordance with a map prepared by the topographic committee of the association, showing the areas infected with ragweed. The city board of health assisted by enforcing the cutting of weeds in vacant lots and the commissioners of the various parks had the ragweed destroyed in the public parks under the direction of the association.

"Valuable assistance was given by the Women's Civic League, which appointed a special committee on vacant lots. This committee made arrangements with labor bureaus so that it not only reported lots

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infected with weeds but offered to send workmen to cut them at low rates.

"The storm of September 29 destroyed practically all the leaves and flowers of the remaining giant ragweed in exposed places. As a result of this, and the efforts of the American Hay-Fever Prevention Association, fall hay-fever practically disappeared in New Orleans several weeks earlier than the usual time. This campaign will be resumed next spring, when its management will be placed in the hands of the State Hay-Fever Association.

"The American Hay-Fever Prevention Association believes that what has been effected in New Orleans can be done in all towns and cities. In some of the smaller towns, especially those catering to summer visitors, this could be accomplished before next summer. The statement that a town is free of hay-fever will prove an advertise-

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ment that will easily repay the cost of destroying the hay-fever-producing weeds.”

### 2. LOCAL TREATMENT BY NASAL APPLICATIONS

*Local treatment of hay-fever* has been viewed with diverse opinions by every writer on the subject. Many good authorities condemn all internasal treatment as useless and irritating, while others strongly advocate its value. It needs no argument to show the value of nasal and throat applications of antiseptic nature in the early stages of influenza or any other neutral catarrhal irritation of the eye, nose or throat. Indeed many household epidemics have been shortened or aborted by the careful attention to these parts. I am not alone in the statement that severe household epidemics have been deprived of their danger by careful cleansing of the nasal

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mucous membrane before the infection became systemic. Indeed this is the routine treatment in every well-regulated family where children are found, especially during winter and spring, and in the early fall. It is much more important that this should be carefully observed if the neighborhood is infested with an epidemic of catarrhal colds. The repeated infection of some families and the escape of others is not so much in the vital resistance of the several members, but the neglect in the individual of personal hygiene. This is true of all diseases, as well as of hay-fever. It is true that children, and young people in general, are more likely to contract catarrhal colds if they are burdened with adenoids or hypertrophied tonsils—diseased by repeated former attacks. I believe that the acute infectious diseases, particularly in children, may be lessened

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by most thorough and repeated sterilization of the nasopharynx, and just as house epidemics are never excusable evils so I claim the same to be eventually true of hay-fever.

The important result to be obtained through local treatment is the prevention of the paroxysms, and, ultimately, the removal of the recurring habit periods. The destruction, if possible, of the recurring habit. Years ago I was led to treat my hay-fever patients by cleansing the nasopharynx with an atomizer containing a warm solution of boric acid (ten grains to an ounce of water) or Dobell's solution, after which I carefully wiped the mucous membrane and applied menthol and camphor and liquid cosmoline freely to the parts. This procedure afforded considerable temporary relief in a large number of cases when there was present simply

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turgescence of the whole naso-pharynx.

- R. Sodium bicarbonate,  
Sodium borate .....  $\frac{1}{2}$  ss  
Carbolic acid .....  $\frac{1}{2}$  j.  
Glycerin .....  $\frac{1}{2}$  ij.  
Rose water (25 per cent.) ..... q. s. O j.  
SIG.—Teaspoonful to one ounce of warm water.

This I thoroughly use in both nostrils, first by means of an atomizer, after which, with a curved applicator or cotton-carrier, I very carefully swab the whole naso-pharynx. I scrub most carefully and gently every portion of the mucous membrane, being sure to reach between the turbinated bones and all around and over every slight prominence. I then as carefully dry the membrane with clean cotton, and use freely a mild solution of menthol and camphor in albolin, in proportion as follows:

- R. Menthol ..... gr. v.  
Pulverized camphor ..... gr. v.  
Albolin .....  $\frac{1}{2}$  ij.

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I loosely plug the nose for a few minutes to retain the oily application. It is important to sterilize most thoroughly the sensitive areas of the nose, as we are unable to determine whether one or more may be affected, and by this mild yet thorough treatment we cleanse effectually the whole nasal chamber.

This treatment was so extremely simple that for a long time I doubted its real value, but as so many sufferers have express their relief, and were willing and anxious for me to continue the applications, I have concluded to offer my methods in full confidence of their usefulness, with a warning that for successful treatment the instructions for cleansing and scrubbing must be followed in careful detail. Good results need not be expected by simple irrigation and swabbing—the whole nasal mucous membrane must be *thor-*

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*oughly washed and gently scrubbed before the oily applications are used.*

This internasal treatment should commence *four weeks* before the expected onset of the paroxysm, and should be done daily, if possible.

I have found many persons who will not tolerate the use of carbolic acid, even in so mild a solution as that given above, the weakest solution frequently causing a severe urticaria.

When various idiosyncrasies to carbolic acid forbid its use, I select as the second best detergent hydrogen dioxid, and commence with the following mixture:

R. Hydrogen dioxid,  
Glycerin.....ss.  
Distilled water.....q. s. 3iv.

With this I spray the nose most thoroughly, following it up with plain warm normal salt to remove the accumulation of

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foam that will necessarily collect in the nasal spaces. A few days, or better, one week, prior to the date of the onset, I increase the strength of the hydrogen-dioxid solution, using something like the following:

- R. Hydrogen dioxid..... 5 ij.  
Glycerin,  
Distilled water ..... aa 5 ij.

This must be removed also by means of the normal salt, as already mentioned. In a number of cases I have found glycerin objectionable as a vehicle, producing an irritation of much annoyance. In such cases I omit the glycerin and substitute normal salt. In a few cases the hydrogen dioxid produced an inflammation of the mucous membrane that would require its dilution. We find many personal idiosyncrasies in a large number of hay-fever sufferers that one might go on indefinitely

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with modifications of treatment, but, as in general practise, it is our aim to treat the individual primarily, and we can not dogmatically hold fast to any special drugs or formula.

In the few obstinate cases in which sterilization seems to provoke trouble, and the slightest manipulations of the nose and throat precipitate violent paroxysms, I use on the nasal mucous membrane the following powder:

R.	Morphin. sulf.....	gr. ij.
	Boracic acid.....	3ss.
	Powdered camphor.....	gr. x.
	Powdered starch.....	3iv.

SIG.—To be used as a snuff frequently.

If patients object to the use of the snuff, and occasionally we will find some who will do so for cosmetic reasons, I prescribe the following, to be taken internally:

R.	Tablet Suprarenal Ex.....	gr. v.
SIG.—	One every three or four hours.	

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Many physicians claim that relief can not be afforded to hay-fever patients without using cocaine or eucain at some time during the management of troublesome cases. It is very exceptionally that I resort to either; possibly an unusual case will require one or more applications to control a local storm, yet the majority of patients never receive cocaine from my hand.

In severe cases that came under my care after the disease had been well established, when I had no chance to conduct a preliminary course of benumbing, I have been forced to prescribe something like the following:

Menthol.....	gr. viij.
Boric acid.....	gr. xxx.
Albolin.....	3 ij.
Solution of Eucaïn "B" (4 per cent.).	3 ij.

This is applied carefully and thoroughly on cotton applicators to the mucous mem-

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brane of the naso-pharynx. It may control the attacks, and it frequently aborts them and keeps the patient decidedly comfortable. I have found the direct application of the remedy more satisfactory than the atomizer. In some cases, for a few days, this application must be made two or three times daily.

H. L. Swain recommends the local use of the aqueous extract of the suprarenal glands in certain chronic conditions of the hay-fever type, as a powerful local vasoconstrictor and contractor of erectile tissue. The local effect can apparently be obtained any number of times without entailing a vicious habit, such as might result from cocaine. Ingals and Ohls report that they have obtained much relief in these cases by the use of an extract of suprarenal capsule prepared as follows: Adrenals (Armour's), ʒj; boric acid, gr.

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xvj; cinnamon water, 3iv; hot camphor water, 3j; hot distilled water, enough to make 3ij. Mix, macerate for four hours, and filter. This solution remains stable for several weeks. It is used as a spray four or five times a day. I have not had occasion to resort to the local application of this substance, but I have had one patient who was distinctly benefited by internal administration in doses of gr.  $\frac{1}{4}$  to gr. j, as often as four times a day. He was a catarrhal young man of neurotic temperament, who came to me during the first week of his attack, and who objected to the usual routine sterilization of the naso-pharynx.<sup>1</sup>

The formula:

Adrenal chlorid..... 3 ij.  
Normal salt sol.....q. s. 3 j.

is more elegant and convenient.

<sup>1</sup> Personally the use of the suprarenal extract has been of little value owing to the violent sneezing provoked.

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### 3. AS TO DIET, EXERCISE AND REST

In old cases, when the nerve-habit has long been formed, treatment should commence at least two or, better, three weeks before the anticipated recurrence of the paroxysms. All bodily irregularities must be corrected and tendencies to constipation or dyspepsia removed. Amylaceous indigestion should be corrected by the exclusion from the dietary of too starchy foods. For the elimination of excessive uric acid, or other waste products, and to relieve constipation, the systematic administration, morning and night, of sodium phosphate is invaluable. If the appetite is not good, the regular use of the tincture of nux vomica, ten to twenty drops three times a day, is strongly indicated. In anemic cases pills of carbonate of iron or, probably still better, the pills of valerianate of quinin, iron, and zinc are necessary.

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In nervous cases with anemia, valerianate of zinc, one grain with two grains of the compound asafetida pill, two or three times a day (after Morell Mackenzie), will be found valuable. Careful diet, a tranquil mind, and moderate exercise are essential. Outdoor exercise, with a daily tepid bath followed by vigorous friction of the whole body, will help to eliminate waste material. The patient should not unnecessarily expose himself to direct rays of the sun, as they are calculated to excite intense reflex irritation of the sensitive nerve centers. Much trouble may be averted by the use of a sunshade or umbrella and by the avoidance of exercise in the sun.

It must be understood that with the general hygienic and constitutional treatment the course of local prophylaxis by daily sterilization is most necessary.

The treatment of neurasthenic cases, or

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those in which a decided derangement of the general system as well as of the nervous energy exists prior to the attack, requires the greatest tact and skill. If there is little local catarrhal disturbance there will be great difficulty in combating the disease in the face of the deepest vitality and lessened nervous resistance. In such cases I place the patients upon a diet, somewhat like that in the appended list, and urge strict adherence to it. After obtaining careful urinary analysis and other clinical data, I often further specialize in the diet, or I may increase the variety according to the needs of the individual. In these cases I always urge the drinking of large quantities of water, unless there is some strong contraindication. Neurasthenics will often avoid water between meals. I at once order systematic massage. If the patient does not care for a

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masseur, I order a daily tepid bath of a temperature between 80° and 85° F., with a coarse towel rubbing, followed by a douche of cold water along the spine. This should be continued for at least two weeks prior to the onset of the paroxysms.

Rest for the overtaxed function is imperatively demanded. Unfortunately, this is easier prescribed than carried out. In wealthy patients the Weir-Mitchell rest-cure often gives brilliant results. In other cases a change of scene and a temporary rest from business or society may be accepted when the sanitarium would be out of the question. Quiet resorts on the sea-coast or in the mountains are desirable. Nothing is better than two or three weeks on the ocean. A compromise may be obtained by having the patient give up a portion of the daily duties and go to bed earlier at night. The patients should not

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be allowed to discuss their ailments too freely. Horseback riding, bicycling, rowing, and walking—in fact, any outdoor diversion not too violent—are to be recommended.

If the patient suffers from insomnia, careful administration of a hypnotic may help to reestablish the sleep-habit. At first give a warm bath, and a glass of warm milk or malted milk before retiring. If this and other similar measures do not avail, five grains of Veronal capsule may be given one hour before going to bed. If the patient is accustomed to wake after a short sleep, the Veronal should be given at bedtime. Full amounts of sleep are necessary to neurasthenics. Depressants, such as the bromids, chloral, and the opiates should be avoided. Any coexistent gastric or cardiac trouble must be carefully treated, and the bowels kept open regularly.

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The diet that I find most desirable to follow, generally speaking, is that which is applicable to the gouty or uric acid diathesis.

*General Rules.*—The diet should be liberal, but not stimulating, with moderation in animal foods, and very little of foods having a tendency to produce acids in the system, such as starches, sugars, fats, and fermented liquors. Patients may take soups—clear or vegetable—and weak beef-tea or broths.

*Fish.*—Fresh fish and raw oysters.

*Meats.*—To be taken once a day only—mutton, chicken, underdone roast, sweet-bread.

*Eggs.*—Moderation. White of eggs, raw, or stirred in drinks, such as lemonade, occasionally.

*Farinaceous.* — In small quantities. Toast, stale bread, bread from whole

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wheat, rye bread, milk-toast, rice, crackers.

*Vegetables.* — Fresh, green varieties preferable; celery, lettuce, watercress, cucumbers, onions, cabbage, salads, sparingly of baked potatoes, young peas, string beans, and spinach.

*Desserts.* — Oranges, lemons, apples, apricots, pears, peaches, cherries, blancmange (not after meals, however), stewed fruit.

*Beverages.* — Water, plentifully, especially before meals; plain soda, milk, buttermilk, weak tea or coffee (without sugar), toast-water, lemonade. Mineral waters, such as Saratoga Vichy, Berkely (Hot Springs), Lithia Water, Carlsbad, and Crab Orchard.

*Stimulants.* — Light Hock; Bordeaux in small quantities and well diluted.

*Articles Forbidden.* — Patients must avoid rich soups, hard-boiled eggs, fried

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and made dishes of all kinds, entrées, pickles, spices, veal, pork, duck, goose, salmon, lobster, crab; preserved, dried, and salted meats; salt fish, pickled pork, asparagus, old peas, beans, tomatoes, mushrooms, truffles, dried fruit, preserves, pies, pastry, rich puddings, patties, new bread, cheese, sweets, malts, sweet wines, strawberries, rhubarb, cider, fermented drinks, beer.

### 4. WHEN ASTHMA OCCURS AS A SEQUEL

About five to ten per cent. of my whole number of hay-fever patients have suffered more or less from asthma. Asthma, as a sequel in these cases, manifests itself about the end of one week or ten days after the expected paroxysms of hay-fever, and is induced usually by some undue exposure or a damp or rainy day. My asthmatic patients, I find, were among those irregu-

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lar in treatment, or those who had first called late in the disease. In these cases much mucus had accumulated in the larger tubes. If I can not clear the bronchial tubes by an emetic dose of ipecac, I prescribe somewhat as follows:

Potassium iodid.....	3ss
Ammonium muriate.....	3ss
Sirup of Yerba Santa.....	3j.

A teaspoonful administered every two hours generally brings relief. A number of asthmatic patients require a solution of nitroglycerin, one per cent. Of this, one drop every two hours for two or three days is given. Occasionally it seems imperative to give morphin. Some of my asthmatics have informed me that they can bring about immediate relief by plunging both hands in hot water and taking a drink of whiskey, followed by a large draft of hot water. It is possible for some persons

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to voluntarily combat their asthmatic attacks, and for this reason they should be encouraged to practise certain breathing exercises until they can in a measure control their respiratory apparatus. Asthmatics usually have, however, a preexistent catarrhal state of the bronchial tubes, which exhibit marked vasomotor changes on slight irritation. If I see these patients early, I prescribe five-minim capsules of the oil of sandalwood four times a day, or the compound salol capsule, and by the time their period arrives, the bronchitis is fairly well cleared up.

The inhalation of the fumes of burning niter-paper or specially prepared powders, or of cigarettes, gives relief in many cases. The powders used at the Brompton Hospital by Sidney Martin contain one part each of anise and niter, two parts of stramonium leaves, and five grains of tobacco

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to the ounce; one teaspoonful is to be burnt on a plate and the fumes inhaled. A pill containing  $\frac{1}{4}$  of a grain of morphin, with  $\frac{1}{200}$  of a grain of atropin sulfate, given at bedtime, is sometimes useful in connection with the inhalations. Extract of stramonium (1-16 of a grain) may be substituted for the atropin.

S. Solis-Cohen has used successfully the following formula:

R. Morphin sulf..... gr.  $\frac{1}{8}-\frac{1}{4}$ .  
Strychnin sulf..... gr.  $\frac{1}{6}-\frac{1}{40}$ .  
Hyoscine hydrobrom.... gr.  $\frac{1}{200}$ . M.  
Sig.—Give hypodermically at bedtime.

The following may be administered at night:

R. Camphor..... gr. ss  
Dover's powder..... gr. vj.  
Make four capsules.  
Sig.—Take one on retiring.

Van Sweringen calls attention to a line of treatment in a very obstinate case of

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bronchial asthma that was attended by remarkable results. The attack had lasted for two weeks, during which time all the antispasmodics had in turn been exhausted, and the patient had secured but a period of two hours' freedom at any one time. Finally, based on the theory that if asthma was a reflex it must be under the control of Setschenow's inhibitory center, and that anything that would stimulate the inhibitory center would lessen the reflex-spasm, quinin and strychnin were given, with excellent results. The dose of the quinin was seven grains. The extract of nux vomica was given in  $\frac{3}{4}$ -grain doses, and to this was added  $\frac{1}{4}$  of a grain of co-dein sulfate. In the interval the iodids were continued.

However, the use of sedatives and inhalations must be limited, especially in the milder and uncomplicated forms of asth-

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ma, while efforts to benefit the patient's general condition are strongly indicated. Diet is an important part of the treatment of many cases. Not all cases of asthma are due to uricacidemia, but nearly all cases are benefited by attention to the diet and elimination of excess uric acid.

Of remedies that may be continuously administered to patients who have frequently recurring attacks, two are most constantly used—namely, iodid of potassium and arsenic. The iodid may be most conveniently given with stramonium, as in the mixture devised by Martin, which consists of  $\frac{1}{4}$  of a grain of extract of stramonium, two grains of extract of licorice, three grains of iodid of potassium, and five minims of chloric ether. This mixture may be given two or three times daily in cases of asthma. It possesses two disadvantages, however. The stramonium leads, in

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some cases, to paralysis of accommodation, but by diminishing the dose, the patient soon ceases to experience discomfort from the remedy. If given alone, the iodid must be administered in five-grain doses two or three times daily, the medicine being discontinued from time to time. Arsenic by itself, in doses of three minims of the liquor arsenicalis, is a useful remedy for continuous administration in asthma, and it may be combined with potassium iodid (three to five grains) in a mixture. Hydrotherapeutic treatment is of use in some cases of asthma. The patient should be accustomed to gradually colder baths of short duration with douches.

### 5. THE USE OF SERUMS—DUNBAR'S SERUM

The wide recognition of the serum treatment of hay-fever by Dunbar, of Ham-

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burg, Germany, requires me to quote sufficient of his writings that my readers may appreciate the value as well as the limitations of his work. To very briefly summarize: Dunbar has prepared hay-fever *antitoxin* by inoculation of horses with the toxins derived from the albuminoid body found in the starch particles of the pollen. The serum obtained from the horse is dispensed either in a liquid or dry form, and is designed to be applied to the mucous membrane of the nose and the eye when required.

His serum has been named *Pollantin*, and two forms are on the market, one prepared from rye pollen, especially used for spring and summer hay-fever, or "rose-cold," and the other, prepared from rag-weed pollen, designed as a remedy for hay-fever occurring in the late summer and fall. Dunbar thinks that hay-fever is the

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result of a specific poison found in pollens and is an albuminoid body—and his anti-toxin is intended to inhibit, or immunize patients against the *pollen toxins* if used previous to the hay-fever season. Its use is also to palliate the symptoms in cases where the disorder has already made its appearance. *Pollantin* produces a sensation of relief and cool comfort when applied to the inflamed mucous membrane of the nose or eye. This comfort remains for some time, but the relief is variable.

In 1902, Prof. W. P. Dunbar published,<sup>1</sup> as an appendix to a presentation of the history of our knowledge of hay-fever, the opinion, based on experiment, that hay-fever is a disease caused by a poison derived from plants. These toxic substances are found in the dust of the blossoms of

<sup>1</sup>Zur Ursache u. spezif. Heilung d. Heufiebers.  
Verlag Oldenbourg, München, 1903.

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certain plants. They are present in the albumin of the pollen and are septic in nature. According to this theory, it would be possible, by means of the isolated toxic albumin of the pollen, to determine whether or not a given disease was hay-fever. It was also hinted, and in a publication that shortly followed,<sup>1</sup> positively asserted, that it was possible to produce a specific antitoxin by inoculating animals, *e.g.*, rabbits or horses, with the albumin of the pollen. It was possible with this antitoxin to neutralize the poison of the pollen *in vitro* so that the latter would no longer cause symptoms in hay-fever patients. It was also claimed that symptoms that had already set in could be overcome by the use of the specific antitoxin.

By means of this timely use of the anti-

<sup>1</sup> Zur Frage betreffend d. Aetiologie u. spezif. Therapie d. Heufiebers. Berl. klin. Woch., 1903, No. 24—26.

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toxin the outbreak of the hay-fever symptoms should be prevented. As a result of further investigation he was later able to prove definitely<sup>1</sup> that by the proper use of the antitoxin it would be possible to rid patients of their disposition to hay-fever, and to immunize them so they could dispense with the use of the antitoxin or any other therapeutic agent without having to fear further attacks.

Th. Albrecht, the secretary of the German Hay-Fever Association, designated the appearance of my first article as a turning-point in the history of hay-fever. Other colleagues viewed the results of Professor Dunbar's comprehensive work with less favor. There were indeed those who claimed that he had added nothing new to the subject. The opinions ex-

<sup>1</sup> Zur Ursache u. spezif. Heilung d. Heufiebers II.  
Deutsch. med Woch., 1911, No. 13.

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prest by the laity were also widely different in character. Some were unable to express their thanks in terms sufficiently strong, others claimed that the specific treatment suggested by him was absolutely worthless. An American correspondent wrote to him: "Your stuff is not worth a tinker's dam." In the face of such divergent opinions it seems worth while to cast a glance backward over the decade that has passed, to determine what assertions were right and what opinions were incorrect.

Whether we are right in looking upon hay-fever as a product of our modern culture, appeared to Professor Dunbar today, even more than it did ten years ago, an open question. In the last ten years there has been much published concerning hay-fever, not only in the leading journals, but also in the lay journals.

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In so far as the latter deals with his work, they had not had his cooperation, nor had they consulted his wishes. There are to-day many hay-fever patients who are absolutely in the dark as to the nature of their disease. Even in Hamburg, after a scientific exhibition at which his hay-fever material was shown, many adults came to him with the request that he should determine whether or not they had hay-fever. He was even more surprized to learn that there are to-day physicians who either deny the existence of hay-fever or know nothing about it. In view of this obtuseness it seemed to him very bold to say that two hundred and fifty years ago there was no hay-fever, simply because we have no authentic and convincing records from that time. The disease may have been very widespread then. There was missing perhaps only the man to notice the

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periodicity of the disease, its dependence upon the seasons of the year, and to correctly correlate the facts and draw proper conclusions.

Until ten years before Dr. Dunbar says no one had been able to offer a clear and convincing explanation of the cause or nature of hay-fever. This is clear from a perusal of the literature up to that time.

Dr. Dunbar, himself a sufferer from hay-fever, had the opportunity during many years to test the merits of the various hypotheses concerning the cause of the disease. He finally came to the conclusion that only the pollen theory could be right. In his monograph concerning hay-fever, which thus far I have given in his own language as above, he described the observations which forced him to accept this explanation. For many years the attempt to definitely prove the theory met with an ob-

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stacle which seemed insuperable, viz., the impossibility of getting pollen in a pure state. In view of the extremely simple method of doing this, this fact appeared to him to-day a remarkable one. He felt constrained to offer the following explanation:

"Year after year I consulted with botanists as to the best method of getting pollen in large quantities. Various methods were suggested to me, among others that of spreading large cloths over the meadows. I also sucked up into bottles large quantities of air in the attempt to get pollen, and attempted many other things. None of these methods met with more than moderate success, until finally I hit upon the simple procedure of shaking blooming plants, for instance stocks of wheat, and catching the dust that was shaken out. I succeeded better later by taking the ears

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shortly before they began to bloom and putting the stocks in water in a warm place. In this way I was soon able to gather pollen in large quantities, and, more important still, to isolate the pollen grains of different plants, free from all contaminations, including micro-organisms.

"After having obtained in this way the pollen of rye, wheat and ray-grass pollen (*Lolium perenne*), I could at once begin to attempt the settlement of important questions. A minimal amount of the plant dust when introduced into my conjunctival sac, or my nasal passage, caused in a very short time most pronounced hay-fever symptoms. The same experiment on my laboratory assistant, who did not have hay-fever, had no effect at all. Within a few days I extended the scope of my experiments so as to include two hay-fever pa-

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tients, who happened to be working in our institution, as well as three other assistants who did not have hay-fever. The result was always the same. The hay-fever patients reacted just as I did. Those who had no hay-fever and served as controls were not at all affected by the introduction of the pollen. These experiments were repeated later on very many patients and people without hay-fever, invariably with the same results.

"The next important point that suggested itself to me was to determine whether or not this toxin was active at other times of the year than during the hay-fever period. Formerly it had been urged against the pollen theory that with the same pollen which had been active during the hay-fever period, no results could be achieved at other times of the year. Thus, for instance, Sticker was of the

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opinion that Woodward had proved that pollen was inactive except during the hay-fever period. He therefore was forced to come to the conclusion that for the production of an attack there was necessary the disposition on the part of the individual and the season of the year. The nature of the action of the season of the year was explained by some authors as a sort of an "Unstimmung," a sort of spring revolution. This explanation appeared to me very doubtful, because of the fact that this process occurs in European patients in springtime; in most American patients, however, in the fall.

"My experiments on this subject resulted as follows: Pollen which had been carefully dried soon after gathering was active later at any time of the year. Pollen, however, which I enclosed in bottles in its fresh condition underwent cer-

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tain changes, characterized especially by the formation of a liquid.

"Pollen which had been spoiled in this way proved later to be inactive. I might add here that these observations explained the occurrence of sporadic cases of hay-fever in the winter time. Pollen which has found its way into a dry room can remain active until the winter season—indeed, for many years, as I have shown. One blossom which has remained for eleven years in the herbarium retained an undiminished activity. Pollen which, on the other hand, falls to the ground in the open air, is destroyed by the first following rain. The fact that the pollen is carried down out of the air by the rain clearly explains further the remissions on certain days which had hitherto been so difficult to understand. By means of the isolated pollen I had then met those requirements in my attempts at

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an etiologic explanation which I myself have considered necessary. The suspected agent, free from all impurities, when applied to a hay-fever patient, must produce hay-fever invariably, regardless of the season of the year. The same agent applied to a normal person must have no effect. These requirements had, I say, been met by experiment.

"The grass pollen is so small that a single one can not be seen with the naked eye, yet its structure and chemical composition are very complicated. Many pollen grains are covered with hair-like prickles. Adherents of the pollen theory formerly believed that hay-fever was due to these prickles. They asserted that hay-fever patients were extremely sensitive to the mechanical stimulus of the prickles, and that normal individuals were resistant to their action. It is true that some of the

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pollen, which we formerly looked upon as the cause of hay-fever, had an uneven, prickly surface. Some of the first adherents of the pollen theory believe that those pollen especially were active whose blossoms had an intense odor. The disease was accordingly at that time widely called rose-fever, linden-fever, and so forth, instead of hay-fever. I was able to show that those pollen which most often cause hay-fever have a smooth surface. This is true of all grass pollen, of which I have examined thirty-two varieties. These have also no odor. The blossoming of the rose and of linden occurs at the same time as that of the grasses. In 1902 I was able to completely overthrow the belief in the activity of the linden. It happened that in that year the blossoming of the linden was delayed from three to seven weeks in our vicinity, that of the grasses occurring

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at the regular time. The season for hay-fever was probably over at the time that the blossoming of the linden was at its height, and hay-fever patients were able to enjoy the odor of the linden without any ill effects. I can well understand the tenacity with which hay-fever patients cling to the belief that the dust of the rose and linden causes their symptoms. I myself banned from my home every rose and other odorous blossom during the hay-fever period, and felt certain that my suffering was thereby diminished. The relief was not an imaginary one, but was due to the fact that at the same time I kept my windows carefully closed.

“At about the time of the blossoming of the grasses, the pine (*Pinus sylvestris*) also begins to blossom and produces such a plentiful dust that thick clouds of it can at times be seen. This is called sulfur

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rain. I proved, in spite of the opposition of many hay-fever patients, that the dust of this blossom was also of no consequence.

"By such experiments as these and many others I was able to prove that only certain specific pollen could cause hay-fever. This was in direct opposition to Blackley's theory. Other pollen, including those possessing sharp prickles, were absolutely without effect.

"The theory as to emanations, odors, ethereal oils, and so forth, had still to be considered. On opening a vessel that contains much grass pollen one gets an odor much like that of honey, which proved to be without effect on hay-fever patients. The odor of the linden, as well as that of the harmless rose, was proved to be without effect. There was still to be considered the questions as to the action of the ethereal oils. An extract of the oily and

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waxy portions of the pollen, when applied to the conjunctiva and nasal mucous membranes in small amounts, caused a burning sensation. This was quite different, however, from the peculiar sensation experienced by hay-fever patients, which is so distinctive that nothing can stimulate it. These extracts had more effect on normal persons than they had on hay-fever patients. The amount of these substances with which we come in contact in our ordinary walks is so small that they can surely not be responsible for any of our unpleasant sensations.

"Grass pollen is distinguished from that of other plants in a marked way by the small rods which it contains, which look just like bacteria. Patton, in 1877, had already called attention to these rods. He believed that after they left the pollen grains they possess a movement of their

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own, and he drew the conclusion that they constituted the active principle of the pollen. He asserted that by reason of their inherent motility they found their way into the mucous membrane and the circulation and thus caused the symptoms of hay-fever. For a time, I also believed that these small rods played some part in the production of hay-fever. I did not know then that they were composed solely of starch, but thought they contained albumin. After I was able to get hold of great quantities of grass pollen I was able to isolate these rods by means of repeated centrifugation and washing. I was then able to prove that they were absolutely innocuous to hay-fever patients.

"As a result of certain observations, to which I shall refer later, I was soon forced to the conclusion that the active principle of the toxin of hay-fever is an albuminous

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substance. The alcoholic precipitate from a saline extract of a comparatively small number of pollen grains had an intense action on hay-fever patients, but none on normal individuals. After I obtained large quantities of pollen I began my experiments with the isolated albumin. Against this method of procedure it was claimed that I had not been working with a true hay-fever toxin, but with a denatured poison. For this claim there is no evidence; the critics failed completely to show any proof for the correctness of their assertions. From a purely scientific viewpoint, it is certainly better to work with the isolated toxin than the whole pollen grain or an extract from them such as I used at first, before I realized that the toxicity was an attribute of the albumin alone.

“Dr. O. Kammann, who investigated

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this matter at my request,<sup>1</sup> was able to prove that the albumin fraction contains the toxin and that the globulin fraction is entirely inactive.

"Having determined that the albumin of the pollen is the specific cause of hay-fever, it was possible now to carry out my experiments along quantitative lines. It is possible to extract the albumin from the pollen by means of saline solutions of proper strength and then to precipitate it with alcohol or to obtain it by dialysis, and then dry it. In this condition it retains its activity for many years.

"The experiments which I had done up to this time on hay-fever patients had not conformed to the natural process. In order to conform to these more closely I performed the following experiment: A

<sup>1</sup> Kammann: Zur Kenntnis d. Roggen-Pollens u. des darin enthaltenen Heufiebergiftes. Beitrage z. Chem. Physiol. u. Pathol., 1904, Bd. V, Heft. 7-8, S. 346.

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hay-fever patient and a normal individual took their places in a large glass cabinet in which rye pollen had been distributed. The hay-fever patient took sick, the other remained well. It was not determined by this experiment how much of the pollen had been taken up by the hay-fever patient. The question as to whether or not enough pollen was present in the air during the hay-fever season to cause the symptoms had not been satisfactorily settled. Blackley (*vide supra*) had already made attempts to settle this question by means of a method worked out by Phœbus. He had carefully counted at different periods of the years the pollen which gathered on glass plates, whose surface had been covered with glycerin. My co-workers, especially Liefmann,<sup>1</sup> found that in the heart

<sup>1</sup> Liefmann: Ein Beitrag zur Frage nach d. aetiologischen Bedeutung gewisser Pflanzen' pollenkoerner fuer d. Heufieber. Zeitschr. f. Hyg. u. Infectionskrankheiten, 1904, Bd. 47, p. 153.

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of Hamburg, while hay-fever was at its height, 250 pollen grains accumulated on a surface of one square centimeter during twenty-four hours, *i.e.*, 25,000 to the square meter. It was established that with the first appearance of the pollen in the air the patient began to complain of an itching at the inner canthus of the eye; his suffering became more intense in direct proportion to the quantity of pollen in the air. On rainy days no pollen accumulated on the glass plates, altho they were protected from the rain. Early in June the pollen of the grasses far exceeded those of other plants in numbers, and from about the third week in July grew gradually less, so that at the end of July, or the beginning of August, only a few stray grains were found. Thus can be explained the periodicity of the course of hay-fever and also the occurrence of sporadic cases after the

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hay-fever season is over. There was still no certain method of predicting quantitatively the action of the pollen. Dr. O. Kammann had shown that the organic portion of the pollen of the grasses is about 40 per cent. albumin. He had shown further that about 20,000,000 rye pollen weighed one gram. By means of these figures we could compute the amount of toxin in a single pollen. By means of a solution of known strength of the poisonous albumin of the pollen, it could be determined how many pollen grains were necessary in any given case to produce mild, moderately severe, or severe symptoms. It was evident that different patients were susceptible in varying degrees. A concentrated solution introduced into the conjunctiva or nose of a normal individual causes no symptoms. The majority of hay-fever patients were stimulated by one drop (1-20

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to 1-30 cm.) of a solution of 1 to 20,000 or 1 to 30,000. There were patients, however, who responded to one drop of a solution diluted a million times, the equivalent of the amount of albumin contained in one to three pollen grains.

"Liefmann constructed an aeroscope by means of which he was able to determine how much pollen was taken in with each breath. In the neighborhood of a field of rye one inhales with each breath two or three pollen grains; in the middle of a large city he found that in every cubic meter of air there were about three hundred and eight.

"Thus in this way questions as to the quantitative relationship of the pollen to the attack were satisfactorily answered. By means of these experiments it had been plainly shown that the albumin of the pollen of certain plants, especially that of

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all grasses, is to be looked upon as the active cause of hay-fever. With my co-workers I examined the pollen of 106 plants, and found them all without any action, altho I had examined such pollen which had been considered capable of producing hay-fever. In addition to the pollen, I had been informed that in China at the time of the blossoming of *Ligustrum vulgare* a disease very much like hay-fever was prevalent. I examined the pollen of this plant and found it active. In Southwest Africa, when the grasses blossom, conditions like hay-fever prevail, especially among the half-breeds. One European had to forsake Africa at this time on account of his intense suffering. In Europe he remained perfectly well. On examination it was found that he did not react to the grass pollen. In Africa, however, at this time, the acacia blossom and



GREAT RAGWEED



TALL WORMWOOD



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it has been looked upon as the cause of the condition. This patient was unaffected by the pollen of two different species of acacia. I am in hopes that experiments which we have since then set on foot will explain this disease to us. In addition to the thirty varieties of graminaceæ and cyperaceæ, I have found the pollen of the following plants active: swamp-pink (*Lonicera caprifolium*), lily-of-the-valley (*Convallaria majalis*), hairy Solomon's seal (*Polygonatum multiflorum*), *Oenothera biennis*, rape (*Brassica napus*), and spinach (*Spinacia oleracea*).

"Of special importance is the autumnal catarrh, which occurs in the United States of America, beginning early in September and lasting about six weeks. This autumnal catarrh is much more common in the United States than the vernal catarrh. I have had the opportunity of examining a

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large number of American hay-fever patients, and was able to establish the fact that those patients who only suffer in the fall do not react at all to the albumin of the grass pollen. They do react, however, regularly to the albumin of the pollen of goldenrod (*Solidago*) and of ragweed (*Ambrosia*). I have examined a large number of species of both these plants and they were all active. These patients also react to the pollen of the chrysanthemum and the other asters. Those American patients who suffer only from spring catarrh, not from the autumnal type, react only to the grass pollen, not to that of the goldenrod or the ragweed. A third group of patients suffer from about the middle of May until early in November with a hay-fever-like affection. These unfortunates react both to the grass pollen and to the active agent of the autumnal catarrh.

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Goldenrod and ragweed are very widespread in the United States. They are found not only on meadows, fields, roads and along edges of woods, but grow in the midst of cities in neglected places. In Europe they do not occur naturally, indeed the goldenrod can with difficulty be made to blossom there. The pollen of goldenrod, however, is not scattered as easily as that of the ragweed. All attempts to grow ragweed in this country failed until 1911. In this year, which was extremely hot and dry, I succeeded for the first time. These facts serve as further important supports for the pollen theory. There were, however, still many questions to be settled before all this mysterious phenomena which characterize hay-fever could be explained.

"One very important question, that of individual predisposition, I have only

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lightly touched upon. It is clear that all people, including the inhabitants of large cities, are at certain times of the year exposed to the pollen of many plants, which settle on their skin, conjunctiva, are inhaled into the nose, and taken up into the mouth. By far the largest part of these individuals are unaffected by the pollen, only a very small percentage take sick. The poisonous albumin of the pollen is a substance, therefore, which is innocuous to most people, and is only active in those cases in which there is a special susceptibility. In other words, hay-fever requires an individual predisposition. This personal predisposition is present for the well-known poisons of the pharmacopœia, either not at all or at most in very slight degree. In the case of the infectious diseases it is much more evident. If, for instance, the cholera or typhoid bacillus is spread

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through a city by means of the water supply, only a small percentage of the inhabitants are unaffected. This can be explained on the theory that the cholera organism does not find in most individuals those conditions which are necessary to its existence and growth. The fact that only about half of the cholera patients die can be explained by similar quantitative differences. I do not know of another instance of a substance absolutely inactive as far as a part of the population is concerned, but a very virulent poison for others. The individual predisposition in a case of hay-fever must be of a peculiar sort. It might be explained that the hay-fever poison enters the circulation of some people (hay-fever patients) and not of others. That this is the case I could prove by the demonstration of antibodies in the blood of the hay-

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fever patients. I shall return to this subject later. Here it is sufficient to say that these specific substances could be found only at the close of the hay-fever period; six months later they had disappeared. In normal individuals they could at no time be demonstrated. The gradual disappearance of the immune bodies is easily explained. We know from animal experiment that these substances appear a certain time after infection, gradually to disappear again. At first blush the demonstration of immune bodies in the blood of hay-fever patients would seem to be a sufficient explanation of the hay-fever predisposition. Close study makes this seem uncertain.

On continuing the experiments I found that these immune bodies were not present in all patients, indeed, in the same patient I could not find them in some cases

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two years in succession. The following objection to this explanation was even stronger: A colleague of mine, disposed to hay-fever, who had helped me for many years, allowed himself to be injected with a solution of pollen albumin. One half-hour after the injection marked symptoms appeared in the eyes, nose, and mouth. The patient experienced pains in the chest, expectorated a tenacious, mucoid sputum, and perspired freely. The respiration became rapid and difficult, the pulse-rate was accelerated, and the voice grew weak. After fifty minutes there was a flat, urticarial eruption over the whole body. After twenty-four hours all the results of the injection had not yet disappeared. At the site of the injection there was a marked swelling, which persisted for five days.

"Injection of hay-fever toxin caused the same symptoms in me. A colleague who

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did not suffer with hay-fever reacted to the same dose with a small, almost imperceptible swelling at the site of the injection. Pollen albumin was, in other words, not toxic for him when introduced under the skin. Hundreds of experiments have proved to us that pollen albumin is not a poison in the ordinary sense of the word, and that even when introduced into the circulation it is inactive. Not only is the skin of hay-fever patients permeable, for the hay-fever poison in varying degrees, but it also reacts to the toxin in different ways in different patients. In some cases when a solution of pollen albumin is placed on the skin, there occurs within a few minutes an erythema. If, on the other hand, a patient is very susceptible to hay-fever, the skin may show absolutely no reaction when brought in contact with the toxin. These results may be of value in

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the study of individual predisposition, since they enable us to throw some light upon the question as to whether or not hay-fever is to be looked upon as a result of a hypersensitiveness.

"In the first place, statistics have definitely proved that hay-fever has no relation to any constitutional disease,—for instance, gout; that, indeed, only a very small percentage of hay-fever patients are gouty. It is very commonly believed that hay-fever is due to some anomaly or stopping up of the upper air-passages. A local disease of the trigeminus is assumed by some, with a resulting sensitiveness on the part of certain mucous membranes. The falsity of these conceptions is clear from the experiments cited above. Not only does the whole skin-surface of many patients react to the poison, but subcutaneous infection is followed by characteristic

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effects. By showing that the anal mucous membrane of hay-fever patients reacts to the pollen toxin, I believe that all those hypotheses, which assume only a local sensitiveness on the part of the cranial nerves, or the capital mucous membrane, is robbed of all support. Suggestion, as we have seen, plays a large part in the attempts to explain hay-fever predisposition. I can treat this question together with that of the rôle of specific odors of flowers, cats, dogs, etc. Two colorless, odorless solutions were prepared, and a drop from one of them was placed on the mucous membrane of the eye and nose of a large number of hay-fever patients. Some reacted, others did not. None of them knew what sort of a solution was being used. The applications were then made in a different way, each patient receiving a drop of the solution which had not been used in his

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case before. Those who had reacted the first time did not do so the second. The one solution was physiologic salt, the other pollen albumin. None of the patients reacted to the saline, all reacted to the other solution. In the course of many years I repeated these experiments with many variations. In the place of the salt solution I used solution of albumin from inactive pollen. The results were always the same. In the face of such results, he who would explain hay-fever on the ground of suggestion, simply ignores all the facts to the contrary, and his opinion does not deserve serious consideration.

"Hay-fever is looked upon as a result of an advanced culture and civilization. It happens that there are very few hay-fever patients in the laboring class, and that the Anglo-Saxon races, especially the Germans, English, and Americans, furnish the

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largest number of such patients. That hay-fever does at times occur among the Romans and other nations, I am able to gather from correspondence that I have had with inhabitants of such countries. In St. Louis I met an elevator boy who had hay-fever. Among the Anglo-Saxons the disease is found most often among professional men. Men appear to be twice as susceptible as women. It is often claimed that hay-fever follows a period of strenuous mental work, or of excitement, as, for instance, after examination, or in officers after maneuvers. Hay-fever has often been shown to be hereditary. Most frequently, however, a severe attack of influenza has left hay-fever in its wake. Other causes, as, for instance, a difficult labor, are asserted by patients to have been the exciting cause of their hay-fever attacks. May we conclude from all these

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facts that hay-fever is the result of a disturbance of the central nervous system?

"It was formerly believed that all hay-fever patients were very nervous and excitable. This is certainly not universally true. If we are indeed dealing with a severe abnormality of the central nervous system this, in most instances, makes itself felt only in a hay-fever predisposition. Hundreds of hay-fever patients have written me that except during the season they are altogether well, and I have found among hay-fever patients many with phlegmatic dispositions. Those idiosyncrasies which resemble hay-fever in a way, as, for instance, susceptibility to strawberries, crawfish, iodin, antipyrin, bromids and the salts of quinin, are to-day explained on the ground of anaphylaxis.

"Th. Albrecht declares that ten years ago every physician had his own theory

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concerning the treatment of hay-fever. And I may add from my own experience that every patient also had his own method of treatment, which was, as a rule, very complicated. From my records it is very evident that many patients had ten or more hay-fever remedies, which they used either separately or together. A hay-fever patient takes up at once every new remedy that appears and enthusiastically recommends it to others. As a rule, he learns of the new remedy near the end of the hay-fever season, and while he is using it his troubles disappear and he attributes his relief to the remedy he has been using. In the following spring he is undeceived. In this way one hay-fever remedy after another is consigned to oblivion only to reappear later under a different name. The only remedies that have survived for any length of time are those with narcotic

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effects, as cocaine, adrenalin, anesthesin, morphin, etc. Concerning the danger connected with the use of these narcotics, it is surely not necessary to say a word. In addition, adrenalin and anesthesin and the remedies prepared from them cause in many cases a sensation that is much more annoying and unpleasant than hay-fever itself. I, myself, have tested all the hay-fever remedies on which I could lay my hands within the last ten years. With no one of them did I accomplish a beneficial result. There was indeed no reason to suppose that the remedy could accomplish the things that were claimed for it. It is easy to gather the same opinion if one reads the thousands or more hay-fever histories that I have in my possession. I have called attention above to the fact that on purely theoretical grounds nothing was to be expected from these preparations,

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and that chance had not put into our hands a chemical preparation that was effective. Every physician must warn his patients against the use of narcotics. I shall, therefore, not consider those remedies and methods of treatment that belong to this category.

"In the thousands or more histories which I have been able to read, cauterization, burning, chiseling, and sawing in the nose play a large part.

"It has been shown that the active albumin pollen is a substance of such marked specificity that the albumin which causes hay-fever symptoms in one patient (pollen of the grasses in Europeans) is entirely inactive in other patients (those with autumnal catarrh). On the other hand, the toxin of the ragweed has absolutely no effect on the European patients. By means of the complement deviation

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method I could prove that this specificity could be shown in the hemolytic properties of the different albumins, the albumin of the grass pollen reacting altogether differently from that of goldenrod and ragweed. In view of this state of affairs, it is not to be hoped that chance would furnish us a chemical substance that would either neutralize or render inactive the pollen albumin, or overcome the individual predisposition, which, as we have seen, is also strictly specific. I have come to the conclusion that we can accomplish our end in three ways only.

"First, by finding localities where the specific cause does not occur; second, by protecting the eyes, nose and mouth of the patient from the pollen; third, by active immunization against the toxin, or the use of a specific antitoxin.

"The first method is yearly employed by

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many patients with success. The second method is also successful. Hay-fever patients are free from symptoms in regions in which a specific pollen does not occur. This was to be expected from what we have learned about the cause of the disease. Thus many patients find relief on the sea-shore, in islands, and in barren mountainous districts. In Germany they go to Heligoland. In the United States they retire to Fire Island, Long Beach, the White Mountains, Green Mountains, or Adirondack Mountains during the hay-fever season.

"All my attempts of many years to get rid of the irritating contents of the horse serum have been in vain. As early as 1905, I realized that this would be so, for I proved then that the irritating substance (as I then called the anaphylactic agent) was bound to the euglobulin of the horse serum as was also the antitoxin itself. If

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the euglobulin is destroyed the antitoxin is at the same time rendered useless. I have been able to help patients who have become anaphylactic in two ways: First, by the use of pollantin R., and the suggestion to use this diluted serum only before the occurrence of the hay-fever attack, in the very smallest doses, and if possible only once daily. Patients who follow these directions have informed me that pollantin R. did not irritate them at first, altho it did so later. The irritation was, however, not severe and disappeared within ten to thirty minutes. After this the patient was free from hay-fever attacks for one or more days. Secondly, I have taken advantage of the fact that horse serum anaphylaxis is in most cases specific, but does not appear to me to be always so. I have seen instances in which during the development of a hypersensitiveness to one animal

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serum, patients were rendered anaphylactic to the sera of other animals also. This does not, however, happen often. I have, therefore, administered to patients who could no longer stand pollantin R. a very active rabbit serum with good results. It was not only possible to ward off attacks with this serum, but also to protect patients from further attacks during the hay-fever season. These results appear to me to support the opinion, which I express years ago, viz., that the reaction to the antitoxin, and with it the tendency toward definite immunization, is directly proportional to the degree to which anaphylaxis toward animal serum develops. Patients who have become anaphylactic get along with much smaller doses of antitoxin than other patients, and have, I believe, a better chance to effectually overcome their hay-fever predisposition.

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"This is the goal toward which we must strive. I know of many hay-fever patients, some of whom had attacks of the worst kind, who were entirely free after the use of pollantin for a very short time. I consider these people permanently cured, and so express myself in an article last year. A rhinologist interested in hay-fever wrote to me that he could not understand these successes, and that he and his colleague had never been able to obtain such results. He wrote further that my successful experiences were in marked contrast to the experienced German Hay-Fever Association. In answer to such communications I have placed my material in the hands of the secretary of this Association, Dr. Th. Albrecht. I was very much pleased to learn as a result that Dr. Albrecht had been able to cure and successfully immunize patients by means of pollantin. In a

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recent publication, Dr. Albrecht reported twelve cases in which, after the use of pollantin for a short time, there resulted either a complete cure or at least a marked improvement. These observations are, of course, of intense interest to me. I would ask all colleagues who have made similar observations to be kind enough to communicate them to me. I have only been strengthened in my former opinion that by means of a mixed passive and active immunization a permanent cure of hay-fever can be accomplished.

### 6. EXPERIMENTS WITH AUTOSERUM.

By HAROLD HAYS, M.D.<sup>1</sup>

Within the past year a new advance has apparently been made in the treatment of various persistent and chronic dermatoses by the use of autoserum. Among those

<sup>1</sup> Annals of Otology, Rhinology and Laryngology, June, 1915.

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who have been doing a large amount of work in this direction are Dr. Wm. S. Gottheil and his associates. Gottheil in April of this year published his first report, which was followed later by a more lengthy survey of the subject.

In this report the writer speaks enthusiastically about the beneficial changes that take place, particularly in the cases of psoriasis. All of the cases treated were of long standing, with extensive lesions, in which the usual treatments were of no avail. Gottheil summarizes his experience with autoserum by stating "that it has a peculiar influence for good which enables us to clear off the skin in one-tenth the usual time, with very weak and innocuous local medication, and without any internal treatment at all." His results have been corroborated by Dr. John A. Fordyce and Dr. Howard Fox.

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As a result of the encouraging reports in the treatment of the dermatoses by autoserum, it occurred to the writer that it would be worth while trying this same form of treatment in cases of hay-fever. He arrived at this conclusion after noting the similarity of hay-fever to various skin conditions. His premises may be summarized as follows:

1. Hay-fever is a local manifestation of some internal derangement of the system.
2. Hay-fever has associated with it a nervous element which results in a local paresis of the blood-vessels of the nose.
3. Hay-fever occurs at well-regulated intervals, and mainly affects definite parts, namely, the mucous membrane of the nose, eyes, throat, and lungs.
  - a. Psoriasis (with some other of the

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dermatoses) is a local manifestation of an internal derangement of the system.

b. Psoriasis has associated with it a certain nervous element.

c. Psoriasis occurs in definite localities of the skin (mainly extensor surfaces).

This line of reasoning was further substantiated by reasoning along biologic grounds, for (1) there are certain anaphylactic reactions present in psoriasis and other dermatoses which are at the same time present in hay-fever and asthma. (2) A marked eosinophilia is present in the dermatoses and is also present in hay-fever and asthma.

It was not, therefore, inconsistent or unreasonable to suppose that if a definite improvement or even cure could be obtained from the use of autoserum in the dermatoses, it could be obtained in hay-fever and asthma.

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The writer, therefore, began a series of experiments in August of this year, waiting until the patient was in the prime of his hay-fever attack before beginning the injections.

Autoserum, as the name indicates, is a serum obtained from the patient into whom afterward it is to be injected. The method of obtaining this serum is very simple, and is as follows: A constricting bandage, preferably of rubber, is wound around the patient's arm above the elbow until it is tight enough to almost obliterate the pulse. In a few moments the arm becomes a dull purple from the venous engorgement, and a vein from which to draw the blood is readily selected. Very often the very superficial veins are too small, and a deeper one must be palpated for. The desired amount of blood may be withdrawn in a number of ways. At first the writer

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used the MacRae needles, as suggested by Dr. Howard Fox. These needles are very small and are fitted into a rubber cork which can readily be inserted into a fifty cubic centimeter bottle. On one side is a thin narrow cannula, to which a piece of rubber tubing may be attached for suction. It is claimed that after the blood once starts to flow, a continuous stream may be kept up by proper suction through the rubber tube; but it was the writer's experience that on account of the small caliber of the needle it became clogged with coagulated blood very readily, so that it was difficult to withdraw all the blood that one desired. He therefore had recourse to the simpler (and what seemed to the patient more barbarous) procedure of using a twenty-five cubic centimeter all-glass syringe to which could be attached needles of suitable length and caliber. He was

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able in this latter way to withdraw as much as twenty-five to thirty cubic centimeters of blood.

The blood was immediately projected into a sterilized fifty cubic centimeter bottle, made of suitable size so that it could be used in an electric centrifuge.

This blood was then centrifuged at great speed for from twenty to twenty-five minutes, at the end of which time it was seen that the serum had been nicely separated from the red blood cells. It should be straw-colored in appearance, but very often a small amount of the coloring matter of the blood tinges it, which apparently does no harm.

This serum was then drawn up into a sterilized all-glass syringe and reinjected into the patient, either subcutaneously or intravenously. The writer found the former method satisfactory, and in no in-

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stance was there any untoward results. A large swelling often appeared at the time of the injection, but this disappeared within a few hours.

In a few instances when the centrifuge was out of order. It was necessary to allow the blood to stand overnight in the ice-box. The separation under these circumstances was just as good, but whether any chemical change took place, it is impossible to say.

In this series of experiments twelve cases were treated. The treatments were given in the writer's office, under the best conditions possible. Each patient was intelligent enough to let him know in a satisfactory way just what results there were from the injections. At first there seemed to be a period of vast improvement, and he was in hopes that we were at last on the road to a discovery of some specific cure.

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However, the improvement lasted but a very short time, and then the patients were just as bad as ever. It is, therefore, necessary to report these experiments from a negative point of view, in the hope that it will lead others to do further research work along the lines of experimental biology.

It will be noticed in the cases which are reviewed that the amount of serum injected was very much smaller than that used by skin specialists. Gottheil in his later paper speaks of one case where he withdrew as much as one hundred and fifty cubic centimeters of blood, from which he obtained seventy cubic centimeters of serum. In these cases the largest amount of serum injected was fifteen cubic centimeters, but it seems that it should have been possible to obtain a reaction of some sort from this small amount, if the treat-

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ment was going to do any good at all. Again, it is possible that in the treatment of the dermatoses the injection of such large amounts of serum was not necessary. As the susceptible hay-fever patient is very sensitive to an infinitesimal amount of pollen, it is not unreasonable to suppose that moderate amounts of serum ought to show some reaction, if the treatment were to be worth anything at all.

It is worthy of note in the series of cases under observation that most of the patients had tried many of the newer treatments for hay-fever, and in no instance was even a semblance of a cure effected.

A few of the cases are detailed below:

**CASE 1.**—Mrs. K. First attack of hay-fever nine years ago, returning each year and lasting from about the 15th of August to the end of September. She tried no cures except “cold” remedies until this

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year, when she was given hypodermic injections of some serum two or three times a week during the hay-fever period, but with no benefit. After the season was over she was in a general run-down condition.

On August 17th this patient had ten cubic centimeters of blood withdrawn; on August 19th, nineteen cubic centimeters; August 21st, twenty-five cubic centimeters; and August 25th, thirty cubic centimeters. At the first sitting five cubic centimeters were injected subcutaneously in the arm; on the 19th, twelve cubic centimeters; on the 21st, ten cubic centimeters were injected into the buttocks, and on the 25th, eight cubic centimeters were again injected into the arm, the blood had stood in the ice-box for twenty-four hours. During the first week the patient seemed considerably improved, but after that time there was a

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retrogression, and the patient was as badly off as ever. This patient has a general hypertrophy of all the mucous membrane of the nose.

CASE 2.—Major D., whose hay-fever dates from 1889. He found that when he was away from the United States he had no hay-fever, but if he returned to this country in the summer it would be just as bad as ever. He had been stationed in Washington, West Virginia, Portland, Oregon, and other places, and in every place had hay-fever. He had tried atropin, adrenalin chlorid and sprays of various kinds, with no relief.

Twenty cubic centimeters of blood were withdrawn on August 17th, half the amount in serum being reinjected, and the procedure repeated on August 19th. The patient then left for Porto Rico. His statement of his symptoms was as follows:

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August 18th he was worse; there was some discomfort most of the day. After the second treatment, until night he seemed considerably better, but he woke up with a sensation of swelling in the right nostril. On the 20th he had very little discomfort all day. On the 21st he had an attack lasting for two hours. On the 22d he sailed for Porto Rico, arriving there on the 27th of August with apparently no symptoms.

In the conclusion of the report the patient says: "Comparing this attack with my best recollections of previous attacks, I should say that the attack I had on the night of August 19th was similar to a previous one six years before. To the best of my judgment the attack this year progressed at its usual rate, and was in no manner retarded by the two treatments administered."

CASE 3.—Mrs. F. had her first attack of

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hay-fever in 1908. Adrenalin was prescribed with no result. A new attack came on while the patient was in England the following year. Walking in the open seemed to help. "This year I have worked in my garden and played tennis, always either to ward off an attack or more often to cure one."

The patient received two injections of ten cubic centimeters, from twenty-two cubic centimeters of blood withdrawn. The injections had apparently no beneficial effects.

Besides these seven cases, five others were treated, the reports of which would be but a repetition of the above. Each was given two or more injections, ranging in amount from five cubic centimeters to fifteen cubic centimeters of serum. In every instance the treatment was a failure.

Moschowitz draws attention to the fact

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that the various common diseases in which anaphylactic reactions are present are usually associated with an eosinophilia. "In asthma, hay-fever, and urticaria the blood contains an excess of eosinophiles; the secretions of the bronchus and of the nose in asthma and hay-fever, respectively, are filled with eosinophile leucocytes. In urticaria, also eosinophilia, both local and general, are found in nearly all skin-lesions (*e.g.*, eczema, prurigo, Dühring's disease, pemphigus, psoriasis, etc.) . . . In connection with the association of many of the manifestations of the exudative diathesis in 'neurotic' individuals, it is significant that Neusser and others have shown that eosinophilia is a common finding in such individuals."

The writer feels that he can best conclude by repeating Koessler's last words:

"I wish to express emphatically a word

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of caution. It will not be long before the commercial manufacturers of vaccines see 'the great advantage and benefit' of this treatment. Hay-fever vaccines will be praised and advertised and put up so attractively that their use will become universal, and soon universally discredited. For the pollen extract is not stable, especially not the higher dilutions. By progressing proteolysis, after three to four weeks, it acquires marked toxic properties which lead to severe reactions. The solutions must, therefore, be freshly prepared every eight or ten days, if these reactions are to be avoided. Whatever the method of active immunization, whatever the dosage and technic, the one sound basis that must underlie all these endeavors is that the material to be injected must be not only sterile, but constantly of uniform potency if used in the same dilution. No extract

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of pollen can comply with this demand if it is older than three weeks."

### 7. DR. E. T. MANNING'S VIEWS<sup>1</sup>

Dunbar elected to immunize passively, and his well-known pollantin is the outcome of his efforts. He injected horses with gradually increased doses of ragweed pollen, with the expectation that a specific antibody would eventually be formed in the serum in sufficient amount for practical use. He hoped that by injecting this antiserum into a sensitized human being, he would be able to neutralize the effect of the protein poison. Thus he assumed that the pollen protein acted as a true toxin. He was rewarded with a moderate degree of success.

Koessler, of Chicago, first began his

<sup>1</sup> Journal of the American Medical Association, February 20, 1915, p. 655.

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work in active immunization in 1910. He used ragweed pollen and treated only cases of the autumnal catarrh variety. He was the first to report definite methods of preparing pollen solutions, and to him must be given the credit of placing this form of the treatment on a scientific basis. He gave injections both in a prophylactic way, before the appearance of the hay-fever symptoms, and after the disease had been established. His results correspond closely with those of the English investigators. He reports ten per cent. absolute cures, seventy per cent. markedly improved subjectively and objectively, twelve per cent. subjectively improved, and eight per cent. not affected.

I treated twenty-one cases; fourteen were objectively and subjectively relieved; in the other seven the treatment was incomplete for one reason or another. Two

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of these seven showed no reaction, either good or bad. Four more were certain that their attacks were lighter. One patient was undoubtedly made worse, a result which I think was due entirely to a mistake of judgment on my part in giving her a large dose without gradually working up to it. Three of the cases had a bad asthma complicating. Two of these were completely under control and the other was much relieved.

It is difficult to determine exactly what should be designated as a cure. Many years ago a great medical philosopher, who was no pessimist in regard to treatment, gave as an aphorism, "Nothing ever gets completely well." It is true that there are few disease processes which do not leave their impress on the organism in some chemical, anatomic or functional alteration. Our desire to apply the word

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"cure" to a treatment probably arises from the effort to keep pace with the medical charlatans who are only too anxious to guarantee so-called cures. So in hay-fever—a disease which is extremely susceptible to all the changes in nervous control of the individual, with some symptoms exceedingly vague and influenced to a large extent by the imagination—it is very difficult to determine just what part this or that remedy plays in modifying the disease process, and in thus assisting in a cure.

Statistics concerning the effect of a therapeutic measure are decidedly unreliable as a guide. But few persons, and these only in rare instances, act on statistics alone. They act rather on experience, either their own or of others. When they do this they are on surer ground than when they rely on bare figures alone.

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### 8. THE USE OF PHYLACOGEN

By I. H. ALEXANDER, M.D.<sup>1</sup>

The value of Phylacogen in the treatment of diseases seems to depend upon whether we are to take the reports of the experiences of many physicians scattered throughout the civilized world, who have intelligently used this form of treatment and have obtained results which they believed are better than those obtained by other methods, or whether we are to depend upon the advice given by the many and voluminous articles appearing in the medical journals, principally in the *Journal of the American Medical Association*, which condemns the use of Phylacogen from every point of view. There is no reason to believe that the articles appearing in the *Journal of the American Medical*

<sup>1</sup> Pittsburgh Medical Journal, July, 1914.

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*Association* are not sincere and represent correctly the views of the writers of these articles, as well as those of the editor.

It is not the intention of the writer to defend or recommend the use of Phylacogen in the treatment of hay-fever, asthma or any other infection, but as it was my privilege to be the first physician, as far as I have been able to learn, to use this method of treatment for the relief and cure of these most annoying and painful conditions, I desire to report my results and give, as near as possible, my methods of administration. I do not wish to give the impression that the administration of the Mixed Infection Phylacogen constitutes the entire treatment of hay-fever and asthma, altho many cases will recover without additional treatment. I consider it only as a very great aid in the medication and should be used in conjunction

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with other remedies, given for the relief of symptoms, etc. Pottenger says of the use of Tuberculin in tuberculosis, there is more to the Tuberculin treatment than having a patient suffering from tuberculosis and a syringe loaded with Tuberculin to inject into him.

My experience with Mixed Infection Phylacogen in the treatment of bronchial asthma has been somewhat more extensive than my hay-fever experience. Thirty-six cases have been treated to date. Only one case insisted that he had not been benefited. This case had found relief from his suffering by the hypodermic use of Adrenalin, which he administered himself, often using as high as twenty injections a day. This case improved on Mixed Infection Phylacogen at first, and for two weeks was symptomatically well. Physical examination of the chest at that time failed to de-

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tect the physical signs of bronchial asthma, but within a week of the time of the last examination he was suffering just as severely as before, and was using his hypodermic syringe as frequently as ever. Physical examination did not present sufficient evidence to account for his apparent severe dyspnœa. This case, I believe, had formed the habit of using Adrenalin. Of the other thirty-five cases, thirty recovered and have remained well from one to three years. Two cases have recurred twice and were finally cured by administering Salvarsan.

### 9. THE CALCIUM SALT TREATMENT

By HAROLD WILSON, M.D.<sup>1</sup>

The reports of Emmerich and Loew<sup>2</sup> on the very favorable results secured by them

<sup>1</sup> Gouty and rheumatic cases are undoubtedly much benefited by the use of calcium salts as Dr. Wilson points out in this article.

<sup>2</sup> Emmerich and Loew: Erfolgreiche Behandlung

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from the prolonged administration of calcium chlorid in the treatment of hay-fever induced me to make some trial of this drug during the season of 1915. A brief report of the results will be given in this communication.

Whether the ingestion of calcium salts has a direct inhibitory action on the proteolytic reactions which appear to be a necessary part of the hay-fever complex, or so modify this reaction as to render the split proteins less toxic, or whether they act by lessening the patient's nerve irritability, seems at this time to be quite undetermined. The employment of calcium salts in hay-fever would be on a much better basis if we were able to rationalize it. At present, it seems to me that this method

des Heufiebers durch lange Zeit fortgesetzte Chlorkalziumzuführ, München. med. Wehnschr., 1913, ix, 2676; Weitere Metteilungen über Erfolgreiche Behandlung des Heufiebers, ibid., 1914, lxii, 41.

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of treatment can hardly claim to be more than "reasonable empiricism." In view of the fact, however, that much other useful therapy rests on a no more secure foundation than this, there is no reason why we should not make a sufficient trial of this method, which has, certainly, many practical advantages.

Twenty-six patients were treated by me during the past season. Of these, twenty-two were treated exclusively with calcium chlorid, and four patients, who had been under treatment by means of injections of pollen solution, were given the drug when their hay-fever symptoms began to develop more or less severely.

One patient had hay-fever of the vernal type only; three patients had both vernal and autumnal attacks, and twenty-two patients had only autumnal attacks. Twenty-two patients gave a positive ophthalmic

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or cutaneous reaction to ragweed pollen; four gave a negative reaction to ragweed. Many cutaneous tests were made with substances other than pollens, the result of which will be made the subject of another report.

Treatment was begun in June, with seven patients; in July with four; in August with fifteen, and in September with two. In no case did any patient take the drug for more than eight or ten weeks before the time of the expected attack, and in most cases the period was much more brief. Emmerich and Loew advise the use of the drug over a very long period, as much as a year, if possible. Altho it has been shown that the maximum calcium retention in the system occurs only after its prolonged ingestion, it remains to be proved that its optimum therapeutic effect in hay-fever requires its daily use for a year before the expected attack. In some

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of the most favorable cases here reported, the relief secured came almost at once, or after taking, at most, only a few doses.

For most patients the calcium chlorid was prescribed thus:

Calcium chlorid crystals ..... 100 gm.

Distilled water to make..... 500 c.c.

M. SIG.—Take one teaspoonful in sufficient water during or after each meal.

This gives the patient about 3 gm. of calcium chlorid daily. The crystalline salt is used in preference to the anhydrous, as making a cleaner and clearer solution. When the anhydrous salt is prescribed, allowance should be made for the water of crystallization, of which in the crystalline salt there are six molecules ( $\text{CaCl}_2 + 6 \text{H}_2\text{O}$ ):

Calcium chlorid, anhydrous..... 50 gm.

Distilled water to make..... 500 c.c.

M. SIG.—Take one teaspoonful in sufficient water with or after each meal.

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There was no serious difficulty in taking the drug as thus prescribed. One patient experienced gastric distress until the dose was reduced; another complained of weakness and loss of appetite, and had to use it intermittently in a lessened dose; another thought it caused a diminution in the urinary output, while another thought the flow of urine was increased. It has not been observed that the daily ingestion of 3 gm. of calcium chlorid has been followed by any marked bodily disturbance. In fact, much larger doses than this can apparently be taken with entire safety. Cow's milk contains 0.198 per cent. calcium monoxid. A pint of milk contains about 0.71 gm. calcium. Three gm. of calcium chlorid crystals contain about 0.55 gm. calcium, so that more lime is taken by the daily use of a pint of milk than in the dosage prescribed above.

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The table on page 268 gives the results of the treatment with calcium chlorid in the twenty-six cases under observation.

A few of the most favorable reports are given in greater detail:

CASE 23.—Miss M. T., aged 21, had had hay-fever since childhood, beginning in May and lasting until frost. She was sensitive to flowers of all kinds, to dust and to wind. She could not sweep floors without marked discomfort. She had no asthma. Eye and nasal symptoms were most marked. She had been using epinephrin solutions until they now aggravated the trouble. July 2d there were lacrimation, coryza and sneezing of moderate severity more or less continuously. Ophthalmic and cutaneous reactions to ragweed were negative. Calcium chlorid, 1 gm., three times a day, was prescribed. July 9th, eyes were "wonderfully better"; there

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### RESULTS OF TREATMENT WITH CALCIUM CHLORID IN TWENTY-SIX CASES.\*

Case No.	Type of Hay-fever	Reaction to Rag-weed	Duration of Treatment	Result	Remarks
12	A	+	2-3 weeks	+	Under treatment with injections of pollen solutions for ten weeks previously.
13	A	+	2-3 weeks	+	Previous treatment as in Case 12.
14	A	+	2-3 weeks	+	Previous treatment as in Case 12.
19	A	+	2-3 weeks	+	Previous treatment with injections of pollen solutions seven weeks.
22	A	+	10 weeks	0	
23	A-V	-	13 weeks	+++	Immediate improvement and absolute freedom from all symptoms after July 28.
24	A	+	11 weeks	+++	Multiple sensitization.
25	A	+	13 weeks	++	No symptoms until September 1.
26	A	+	16 weeks	+++	No symptoms until September 25. Then only trifling itching in throat and slight sneezing. No other symptoms.
27	A	+	12 weeks	-	September 25, patient writes, "I was worse than usual."
29	A	+	8 weeks	+++	Only slight symptoms.
30	A	+	3 weeks	+	
31	A	+	9 weeks	+	Multiple sensitization (faint).
32	A	+	4 weeks	+	Multiple sensitization.
33	V	-	9 weeks	++	Immediate relief and practical freedom from all symptoms about half the time.
34	A-V	+	5 weeks	+	Reports moderate relief from symptoms during season.
35	A	+	4 weeks	+	Multiple sensitization.
36	A	+	....	...	No report.
37	A	+	5 weeks	++	Very little hay-fever, even in country.
38	A	+	4 weeks	+	Multiple sensitization.
39	A	+	4 weeks	+	
40	A	+	4 weeks	++	Multiple sensitization.
41	A	+	4 weeks	++	Did not take drug regularly.
42	A	-	5 weeks	+++	Peach reaction positive; stopped eating peaches.
43	A	+	2 weeks	+	Left city early in September.
44	A-V	-	13 weeks	+++	Relief immediate and complete; slight recurrences; took drug very irregularly.

\* Explanation of signs: A indicates autumnal; V, vernal; —, symptoms worse than usual; 0, symptoms about the same as usual; +, symptoms less marked than usual; ++, symptoms much less marked than usual; very definite improvement; +++, absolute freedom from symptoms, or only trifling and insignificant ones during season.

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were somewhat less sneezing and coryza; the patient was less sensitive to dust and wind. July 20th, she was much less uncomfortable than usual. On the whole, there was a marked amelioration of symptoms. July 28th, there was very great relief. The patient was practically free from all symptoms. "I never was so helped by anything before." August 13th, the patient reported that she had had no hay-fever symptoms whatever since last visit. Relief was absolute. September 6th, absolute freedom from symptoms continued. This relief continued throughout the season.

CASE 26.—Miss M. R., aged 25, had had autumnal hay-fever seven or eight years; no asthma. Maternal aunt had had hay-fever since childhood. Ophthalmic and cutaneous reactions to ragweed were positive. June 11th, calcium chlorid was pre-

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scribed, 1 gm. three times a day, but owing to some gastric distress which it seemed to cause, the dose was much reduced for several weeks. The full dose, however, was taken later and continued. No hay-fever symptoms were experienced until September 5th, when there was slight sneezing, and itching in the throat. During the rest of the season symptoms were practically absent.

CASE 29.—Dr. W. A. K., aged 40, had had autumnal hay-fever for fifteen years, and slight asthma recently. July 7th, calcium chlorid was prescribed, 1 gm. three times a day. Patient reported in October that he had experienced only trifling symptoms at any time during the season.

CASE 33.—Miss F. P., aged 43, had had vernal hay-fever, usually beginning about June 1st and lasting until the end of July. June 12th, she was having about the usual

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amount of trouble. The ophthalmic reaction to ragweed was negative. Calcium chlorid, 1 gm. three times a day, was prescribed, with much relief, almost at once. She reported, August 25th: "I have been practically free from symptoms about half the time. The rest of the time partly free and partly in trouble. About July 28th took a long railway journey, weather dry and dusty, with no hay-fever symptoms at all."

CASE 42.—F. W., aged 28, had had hay-fever, beginning in August, for several years. Father had hay-fever; no asthma. Ophthalmic and cutaneous reactions to ragweed were negative. Cutaneous and nasal reaction to peaches was positive. Calcium chlorid, 2 gm. three times a day, was prescribed. August 25th, the patient was very comfortable, with scarcely any symptoms. Cutaneous reaction to peaches

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was negative. The patient had stopped eating peaches. During the rest of the season there were very few hay-fever symptoms.

CASE 44.—Miss C. S., aged 25, had had hay-fever for nine years, beginning in early spring and lasting until the second week in October. She had asthma. Symptoms were marked. June 30th, the hay-fever symptoms were distressing. Ophthalmic and cutaneous reaction to ragweed was negative. Calcium chlorid, 1 gm. three times a day, was prescribed. Patient reported September 25th. The hay-fever symptoms, which were severe, disappeared after the second dose of the medicine, whereupon she promptly stopt taking it regularly. Afterward she took a long auto journey without symptoms. During the summer she had occasional slight symptoms, which disappeared im-

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mediately when she took the medicine. She had been practically free from all hay-fever symptoms ever since beginning to take the drug. She thinks the results are "wonderful." She would probably have taken the drug more regularly if it had not seemed to increase the secretion of urine.

1. Some hay-fever patients taking not less than 3 gm. of calcium chlorid daily, even for a short time, are practically relieved from all hay-fever symptoms.
2. Calcium chlorid may be taken in doses of 3 gm. daily for an indefinite time without any apparent injury.
3. It is not indispensable in all cases for a hay-fever patient to take calcium chlorid over a long period of time in order to secure relief.
4. Calcium salts may be given, even when the nature of the patient's sensitization is not known.

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5. The clinical results from the administration of calcium chlorid in cases of hay-fever are such as to warrant its further trial.

### 10. THE POLLEN THERAPY TREATMENT

By J. L. GOODALE.<sup>1</sup>

The object of the following paper is to report the results of observations based upon one hundred and twenty-two cases of hay-fever examined during the past twelve months, with reference to determining, if possible, the value of pollen therapy treatment, and also to ascertain what biologic relations, if any, exist between the pollen of different plants.

In the first place, a word should be said in regard to the method of obtaining and preserving the pollen extracts. For many plants, which furnish an abundance of

<sup>1</sup> Annals of Otology, Rhinology and Laryngology, June, 1915.

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easily detached pollen, it is sufficient to gather the partially opened flowers, bring them into a room without currents of air, and in the course of a few days the pollen may be shaken upon smooth paper. This applies particularly to those plants the cross fertilization of which is effected through the agency of air currents, such as many forest trees and grasses, and certain *Compositæ*, particularly ragweed. In the entomophylous plants, where the cross fertilization is largely effected by the agency of insects, the freshly opened anthers may be clipt and gathered. The pollen is then either placed in the solution for extraction, or it may be preserved dry for an indefinite period. I have taken the pollen from specimens in my herbarium, gathered twenty-five to thirty years ago, of grasses and of ragweed, which on the addition of water excites as marked a skin

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reaction as would be the case with freshly prepared extract.

The extract is obtained from the pollen by soaking in water for a few hours. I have not found it necessary to subject the material to trituration, as advised by some writers; and this is also theoretically unnecessary, since the pollen grains in water promptly undergo a swelling, with solution of their albuminous contents. Several observers have complained of the difficulty of preserving the extract, and say that it is liable to deterioration on standing. After a number of tests, an alcohol dilution of thirteen to fifteen per cent. seems to meet the requirements; and material prepared in this way a year ago has apparently lost but little of its efficiency. It is interesting to observe, in this connection, that we have an example of natural plant juice, namely,

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wine, in which preservation of its qualities is thus secured. The heavier natural wines contain a considerable amount of albuminous matter, together with approximately fourteen per cent. alcohol. More than this percentage checks the further development of the yeast plant, and this amount, while preventing decomposition, does not seem sufficient to cause a precipitation of the proteids of the wine. It is desirable to keep the solution in amber bottles.

A word of caution should be said in regard to the gathering of flower heads for the preparation of pollen extract in the case of those plants which may contain a poisonous substance, as occurs in certain Composite, especially the wormwood group. I have observed a few cases where disturbing symptoms of nausea and malaise followed the injection of such

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materials to a greater extent than would be accounted for by the actual amount of pollen present. In the case, however, of such plants as the Rosaceæ and grasses, these precautions are unnecessary, and we may, in the case of the latter, find it more convenient to strip off the flower heads or anthers by hand.

When the pollen has been gathered and a suitable extract prepared, the latter constitutes then the stock solution from which varying dilutions are prepared. It is theoretically desirable to prepare a stock solution with a definite percentage of pollen extract; but practically this is unnecessary, since individuals differ very widely in their degrees of sensitization, and each case must be examined by different dilutions to determine the correct strength which it is safe to use for him.

The intensity of the skin reaction does

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not always seem to be proportionate to the clinical symptoms of hay-fever. I have seen numerous severe cases where the skin reaction was much less than in other individuals, who apparently suffered from a milder form of the disease. In the case of children, the skin disturbances are relatively less pronounced than in the case of adults, and I have observed several under ten years of age, with apparently well defined hay-fever, who showed no reaction to the prevailing pollens borne in the air at the special season.

In describing the results which have followed the injection of pollen extracts, it has seemed to me desirable to separate those cases which have received treatment during the hay-fever season from those which have been treated during the winter or out of season. I have done this for the reason that it is difficult to draw accurate

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deductions from the statements of the patients themselves. We have, in the first place, to remember that seasons vary in the severity of hay-fever symptoms, dependent upon the amount of rain, heat and cold. Furthermore, the individual's predisposition seems to vary, perhaps as the result of his physical state and habits at the season. Finally, the element of suggestion may conceivably play a part. While I shall, therefore, report the summer cases with reference to the degree of relief obtained, I do not regard these figures as at all conclusive. On the other hand, observations carried out during the winter with reference to changes in the intensity of the skin reaction, may be considered a fairly reliable guide, if it be admitted that the strength of the solutions themselves has not undergone deterioration. This latter point is difficult to deter-

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mine with absolute certainty. Nevertheless, my alcoholic solutions seem now, after the lapse of months, to effect in new cases nearly, if not quite, the same degree of skin reaction which they occasioned when in a fresh state.

At the date of writing, one hundred and twenty-two cases have been observed, of which seventy-four have had more or less treatment, and forty-eight have been seen but once, or are now beginning treatment. Of the cases which may have been considered to have had a sufficient amount of treatment to enable us to draw more or less definite conclusions, thirty-two were treated after the onset of the hay-fever symptoms, and forty-seven were treated during the winter or early spring. Of these cases which were treated at the beginning or immediately before the hay-fever season, twenty-six express them-

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selves as having been more or less relieved, eight could not see material improvement. In estimating the results actually achieved by treatment during the season, I believe that an accurate judgment would place the extent of the relief in a number of instances distinctly below that which the patients express. In other words, I believe the element of suggestion plays here a considerable part. Furthermore, a certain number of these who believed themselves improved showed but slight diminution in the extent of the skin reaction. It has seemed to me that such cases probably represent too high a degree of sensitization to obtain material relief during the hay-fever season, and that a longer period of treatment is required. On the other hand, several of these individuals who reported some months later showed a marked diminution

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of their skin reaction, and it was possible then to undertake their treatment with the result of bringing about still further a diminution in the intensity of the skin disturbances. About one-fourth, however, of those treated during the season experienced after a certain number of injections, ranging from four to twelve in number, such striking diminution in their subjective sensations and in the skin reactions, that it seemed difficult to ascribe the gain to anything else than the treatment, the improvement noted having occurred from one to three weeks before the disappearance of their type of hay-fever in this vicinity.

Serobiologic methods have shown the phylogenetic relationship of the different plant orders and families. The application of these discoveries to the treatment of hay-fever by injection of plant proteids

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promises to assist in the selection of the specific material required for a given case.

Definite reactions are elicited in hay-fever by the pollen of the exciting plants when brought into contact with an abrasion of the skin. The intensity of these skin manifestations may be sensibly diminished by the repeated parenteral administration of the proteids in question. Coincident with the diminution of the skin reactions there seems to occur an increased tolerance of the exposed mucous membranes to the pollens of the plants employed. Pollen therapy in hay-fever may be regarded at the present time as a promising method of treatment, but its value and the permanence of its results remain still to be definitely established.

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### 11. SURGICAL TREATMENT

Surgical treatment of hay-fever is frequently necessary when the patient comes to the physician in the midst of the disease and palliative measures are not possible. In this case I cauterize the small sensitive areas with a flat electrode at a white heat, and without the use of cocaine, as the use of a local anesthetic would make it impossible to find the sensitive spot. It is well to find the sensitive areas with the cold electrode, then turn on the current and bring to a white heat. In this way you can cauterize four or five sensitive areas at one time. Cauterization should not be repeated more frequently than every six or seven days.

Nasal catarrh, nasal polypi, deviation of the septum, as well as sinusitis, should be treated long before the paroxysms. Many

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authorities, including Ballinger, believe sinusitis *is* hay-fever, and, if this is true, selected cases respond to autogenous vaccine. Ballinger quotes Dr. P. M. Farrington's successful treatment by this method. He injects 50,000,000 bacteria at first treatment, gradually increasing the dose to 100,000,000 at third treatment. The injections should be made every third or fourth day.

### 12. A SUMMARY OF TREATMENT

To one who has read the outlines of treatment given in this book it will appear that success in the treatment of hay-fever can be reached through several avenues,—through sera, surgical work, local application and internal medicines. Preparedness is the watchword of our country, and prevention is the keynote in the management of hay-fever. I there-

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fore believe that hay-fever can be prevented by removing the stigma of neurotic inheritance and anatomical defects in youth and by observing the rules of the Hay-Fever Prevention Association, as outlined by Dr. Scheppegrell and quoted in this book. The careful study of pollen by Dunbar has advanced the possibility of cure by this means and will eventually bring about a more scientific adjustment of the remedy. At the present time, however, treatment has not been satisfactory. A more extended study may give better results. Dunbar has caused many enthusiastic workers to offer the results of their labors, and I have quoted Dr. H. Hays' experience with auto-serum, which should be more fully tested, and with him, the honest efforts of Dr. Manning, Dr. Alexander, and the earnest disciple of Dunbar, Dr. J. L. Goodale, whose con-

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clusions as follows are the last words on pollen therapy.

"Serobiological methods have shown the phylogenetic relationship of the different plant-orders and -families. The application of these discoveries to the treatment of hay-fever by injection of plant proteids promises to assist in the selection of the specific material required for a given case. Definite reactions are elicited in hay-fever by the pollen of the exciting plant when brought into contact with an abrasion of the skin. The intensity of these manifestations may be sensibly diminished by the repeated *parenteral* administration of the proteids in question. Coincident with the diminution in the skin reactions, there seems to occur an increased tolerance of the exposed mucous membrane to the pollens of the plants employed. *Pollen therapy in hay-*

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*fever may be regarded at the present time as a promising method of treatment, but its value and the permanence of its results remain still to be definitely established."*

To secure reasonable success it is important that hay-fever patients should begin their treatment at least three or four weeks before the onset of the attack by the use of sedative solutions; a strict cleansing treatment being applied daily, if possible, to the nasal membrane to inhibit the reflex. This local treatment should continue for several weeks. Many patients are relieved with the use of a weak solution of suprarenal, 1 : 10,000 in normal salt. Again, the antiseptic alkaline solution, with an equal quantity of water, usually is sufficient; many are made better by the use of a weak Dobell's solution, and this is my choice of a solu-

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tion. The frequency of a reaction causing congestion has rendered an otherwise valuable remedy undesirable. I therefore have better results with *mild* alkaline solutions of Dobell's, or the liquor antisepicus alcalinicus. Again, many cases do well on an ointment of suprarenal in white vaseline. A small quantity placed in the nose will last longer and be more agreeable than the solution. In asthmatic patients the adrenalin chlorid in oil, used as a spray, is quite effective in selected cases. The danger in the use of cocaine is too apparent to place it in the hands of the patient. Its use in office work is even questionable.

Many internal remedies have been used, and, altho failure is frequent, I have found quinin, atropia, strychnin, antipyrin, iodids and thyroid among those most frequently prescribed. Quinin is

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valuable in massive doses, both locally (snuffed up the nostril in powder form) and internally. The unpleasantness of the toxic effect is as great as the hay-fever itself, rendering it an undesirable remedy. The same can be said of antipyrin used internally. It must be given in large doses—seven to eight grains 3 or 4 times daily for an adult. Its action is antispasmodic, and similar in effect to that in whooping cough. It is possible, and I believe this is true in many cases, it may act as an antitoxin to the irritant from the pollen, and in this way be of benefit when there are paroxysmal asthmatic symptoms.

The iodids act well in small doses when the secretion is slight, but most patients are made worse by their use. Thyroid, in one grain doses, t. i. d., will increase the secretion, dilate the internal vessels

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and thus relieve the nasal congestion. The use of thyroid is usually effective in patients over 50 and when there is gout or rheumatism.

The drugs mentioned above are at best only palliative and in no sense curative. From the report of Emmerich and Leow we can hope to cure the chronic tendency of hay-fever (*Jour. A. M. A.*, Jan. 17, 1915). They report five cases that were broken up and the patients permanently freed from its grip by continued treatment with calcium chlorid. This paper furnished us with the only positive internal remedy and is worthy of more extended trial.

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